

*Request for Variance
Engineered Control of Polluted Soils*

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Pratt & Whitney
Willow Brook and Willow Brook Pond
East Hartford, CT

January 2001
Revised May 2001

PREPARED FOR:

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Comm. No. 88UT002.001

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UNITED TECHNOLOGIES CORPORATION
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1. INTRODUCTION

Loureiro Engineering Associates, Inc. (LEA) was retained by United Technologies Corporation/Pratt & Whitney (UTC/P&W) to perform investigations and evaluation of remedial alternatives to address soil and sediments contaminated with polychlorinated biphenyls (PCBs) within and immediately surrounding Willow Brook and Willow Brook Pond at the UTC/P&W manufacturing facility in East Hartford, Connecticut. LEA completed a comprehensive subsurface investigation of the site during the period from December 1997 to April 1999. The results of the investigation form the basis upon which the proposed remediation, detailed herein, is based. The proposed remediation is also presented in detail in the document entitled *Remedial Action Work Plan - United Technologies Corporation, Pratt & Whitney, Willow Brook and Willow Brook Pond, East Hartford, CT* by Loureiro Engineering Associates, Inc., dated November 2000, revised May 2001. The Remedial Action Work Plan is incorporated herein by reference.

The selected remediation approach consists of the excavation and offsite disposal of soil and sediment from within and immediately surrounding Willow Brook and Willow Brook Pond that contains PCBs at concentrations greater than 25 milligram per kilogram (mg/kg or parts per million (ppm)). Following excavation, a geotextile, soil and rock cap will be installed over the entirety of Willow Brook Pond and the open channel of Willow Brook from Willow Brook Pond to Main Street. The exception to this approach is the wetland downgradient of the dam where excavation of PCBs at concentrations greater than 1 ppm will be performed and the area backfilled and planted to restore the wetland.

Following remediation, the open channel of Willow Brook from the pond to Main Street will be restored to the current configuration. In response to a request by the Department of Environmental Protection (DEP) staff, the Willow Brook stream channel will be slightly modified between the dam that impounds Willow Brook Pond and Main Street to reduce the slope of the banks to control potential erosion and to modify the character of the channel bottom to create a low flow channel with pools and eddies. Willow Brook Pond will be restored to the current configuration. The proposed sediment cap will be installed throughout the pond bottoms. Due to the thickness of the cap (3-feet) and based on the proposed sediment removal volume, the final bathymetry within the ponds will be slightly modified to accommodate the proposed cap section.

1.1 Project Limits

The limits of the project are defined in two separate areas (upstream of the dam and downstream

of the dam) and each area in two separate parts. The limits of the project area upstream of the dam is defined in two parts, Willow Brook Pond and the area of the former oil/water separator. The project area downstream of the dam is defined in two parts, the stream channel of Willow Brook Pond and the wetland area. It is recognized that the potential exists that contamination may exist outside these project limits. However, the intent of this remediation project is to address soil and sediment within and immediately surrounding Willow Brook and Willow Brook Pond. Measures to address contamination beyond those limits described below would be addressed in the future as separate projects.

1.1.1 Upstream of the Dam

Willow Brook Pond: With one exception, the lateral limit of the project area of Willow Brook Pond, inclusive of the small embayment west of the Process Water Facility and south of the lower section of Willow Brook Pond, is defined as the horizontal location of the ordinary water level (reference Figure 1-2). The single exception is the location east of the upper section of Willow Brook Pond in the vicinity of a single soil boring WT-SB-132 (see Appendix A). The project area encompasses this boring to the limits shown on Figure 1-2. Remediation, if necessary, beyond the limits shown will be performed as a separate project.

Former Oil/Water Separator: The lateral limits of the project area in the vicinity of the former oil/water separator is currently defined as the lateral limit of soils containing PCBs at concentrations greater than 25 ppm. However, it is recognized that the potential exists that PCBs and other constituents may exist in soils outside this lateral limit that would require remediation as part of the project. The current estimate of the lateral limits of the project in this area is depicted on Figure 1-2.

1.1.2 Downstream of the Dam

Stream Channel Cap: The lateral limit of the project area for the stream channel cap is the 10-year flood elevation (22.0 to 24.0 feet above mean sea level) as shown on Figure 1-2.

Wetland Area: The lateral limit of the project area for the wetland is currently defined to the south by the northern limit of the stream channel cap and to the north, east and west as the lateral limit of soils containing PCBs at concentrations greater than 1 ppm. The lateral limits of these areas are also depicted on Figure 1-2.

As noted in Section 1 of the May 2001 revision to the November 2000 Remedial Action Work Plan, volatile organic compounds, semi-volatile organic compounds, petroleum hydrocarbons and select metals were also detected in soil and sediment within and immediately surrounding

Willow Brook and Willow Brook Pond. These constituents are commingled with soil and sediment containing PCBs. These constituents will remain in place in those areas in which they are commingled with soil and sediment containing less than 25 ppm PCBs and will be rendered inaccessible with the geotextile, soil and stone cap.

In summary, the components of the remediation approach include:

- The excavation and installation of a temporary lined by-pass channel with inlet and outlet structures;
- The demolition of the existing process water facility building structures and the offsite disposal of construction demolition debris;
- The removal and offsite disposal of the former oil/water separator located between upper and lower Willow Brook Pond and the excavation and complete removal of the structure with offsite disposal of impacted soil and concrete and the placement of an engineered control to achieve compliance with the variance provisions in the RSR;
- The excavation and offsite disposal of approximately 8,500 cubic yards of soil and sediment containing total PCBs at concentrations greater than 25 ppm from within and immediately surrounding Willow Brook and Willow Brook Pond;
- The excavation and offsite disposal of approximately 1,500 cubic yards of soil and sediment containing PCBs at concentrations between 1 and 25 ppm from within and immediately surrounding the wetland area located north of Willow Brook;
- The excavation and offsite disposal of approximately 2,500 cubic yards of soil and sediment from within the open channel of Willow Brook to allow for the installation of the geotextile, soil, and stone cap within the stream channel;
- The placement of a geotextile, soil and stone cap (engineered control) over the entirety of the excavated area (with the exception of an approximately 1-acre wetland described below) to isolate sediment containing less than 25 ppm total PCBs commingled with semi-volatile organic compounds, petroleum hydrocarbons, and select metals to achieve compliance with the variance provisions in the RSR;
- The restoration of an approximately 1-acre wetland located downstream of the Willow Brook Pond Dam; and
- The implementation of two institutional controls consisting of 1) a deed restriction to ensure the affected area will not be used for residential purposes and to prohibit excavation; and 2) installation of a fence around the entire area to preclude access to Willow Brook and Willow Brook Pond.

This particular alternative necessitates a variance to the criteria of the Remediation Standard Regulations (RSRs). In accordance with 22a-133k-2(f)(2)(A) and (B) of the Regulations of Connecticut State Agencies (RCSA), a request to use an engineered control must be submitted to the Commissioner of the Department of Environmental Protection (DEP) and must be accompanied by a detailed written report and plan. This report, coupled with the May 2001 revision of the November 2000 Remedial Action Work Plan, have been prepared to satisfy these requirements.

1.2 Facility Background

The UTC/P&W facility is located at 400 Main Street in East Hartford, Connecticut, and is approximately 1,100 acres in size. P&W initiated aircraft engine manufacturing operations in East Hartford in December 1929. Current site operations are conducted in a 6.5 million square foot complex and include administration and management, manufacturing, testing, research and development and ancillary services. All of these activities take place in the western portion of the 1,100-acre property. The Rentschler Airport and the Klondike Area occupy the eastern portion of the property. P&W previously used these two areas as an airport and a storage/testing area, respectively.

1.3 Description of Site

The Willow Brook and the Willow Brook Pond remediation area is about 4 acres in size. The site is within a mixed residential, commercial, and industrial area of East Hartford, Connecticut. Willow Brook is a small stream transecting the UTC/P&W facility from the northern portion of the Rentschler Airport through to the northwest portion of the current UTC/P&W operations complex. Willow Brook flows in a southwesterly direction in an open channel from the Rentschler Airport, is then hard-piped underground to the inlet of Willow Brook Pond, and continues from the pond as an open channel to a culvert under Main Street. From Main Street, Willow Brook flows in an open channel for a distance of approximately 2,500 feet to the confluence with the Connecticut River (see Figure 1-1). Willow Brook Pond is a man made water body located in the northern portion of the Site (See Figure 1-2). The pond, a single body of water when first created, has been modified various times through the years. It is now comprised of two ponds subdivided by a culvert. Historically, basement dewatering, industrial waters and process wastewater were directed to the pond. Some of these discharges were routed through an oil/water separator. Currently, Willow Brook Pond serves as part of the non-contact cooling water re-circulation system serving the Site.

During routine draining of Willow Brook Pond in September 1997, an oil sheen was noticed seeping through the sediment. P&W reported the sheen to the United States Coast Guard and the DEP in accordance with discharge reporting requirements. Following the detection of PCBs in a sample, the DEP issued P&W a notice of violation (NOV), No. PCB 97-08, on November 7, 1997. In response to the NOV, UTC/P&W developed a sampling work plan and conducted three phases of remedial investigation from December 1997 to April 1999. These investigations identified the probable sources and provided the analytical data to sufficiently define the horizontal and vertical limits of contamination allowing development of a remediation plan.

1.4 Report Scope and Organization

The following sections of this report have been prepared to satisfy the requirements set forth in Section 22a-133k-2(f)(2)(A) and (B) of the RCSA. More specifically, the following sections address the following requirements:

- Demonstrating that the cost of remediating the polluted soil at this site is significantly greater than the cost of installing and maintaining an engineered control and conducting groundwater monitoring;
- Demonstrating that the significantly greater cost outweighs the risk to the environment if the engineered control fails to prevent mobilization or human contact with substances in the soil;
- Demonstrating that the engineered control is well designed and will isolate polluted soil;
- Demonstrating that plans for groundwater monitoring are adequate to ensure that any substance migrating from the subject area will be detected;
- Demonstrating that maintenance plans for the control are adequate and the integrity of the control will be maintained;
- Ensuring that an Environmental Land Use Restriction (ELUR) will be recorded limiting the future use and activities upon the subject area; and
- Ensuring that a surety will be posted to adequately cover the costs for five years of maintenance and monitoring.

The following is a general description of the contents of each of the following sections of the report.

- Section 2 presents a discussion summarizing the site characterization and identifies the areas for which remediation is warranted.
- Section 3 presents an evaluation of the alternatives considered to address the remediation of Willow Brook and Willow Brook Pond. The alternatives presented in this section include complete excavation and offsite disposal of all soil and sediment containing PCBs at concentrations greater than 1 ppm and the selected alternative of partial excavation and offsite disposal and the use of an engineered control. The primary focus of Section 3 is presentation of a cost comparison as it is concluded that both alternatives are technically and administratively feasible.

- Section 4 presents a discussion of the design, management and administrative requirements that are necessary when implementing an engineered control. Specifically, this section details the design elements of the proposed engineered control, presents a general description of the planned maintenance and monitoring plan for the proposed engineered control and a statement of intent that financial assurance for the performance of maintenance and monitoring will be provided, and statements of intent to record an ELUR for the subject area and to provide adequate public notice of the planned engineered control.
- Section 5 presents conclusions regarding the use of an engineered control to address soil and sediment contaminated with PCBs, volatile organic compounds, semi-volatile organic compounds, petroleum hydrocarbons and select metals within and immediately surrounding Willow Brook and Willow Brook Pond.

2. CONTAMINANT DELINEATION INVESTIGATIONS

This section presents a summary of the three previous phases of investigation conducted at Willow Brook and Willow Brook Pond from December 1997 to April 1999. This information is also presented in the May 2001 revision of the November 2000 Remedial Action Work Plan, which has been submitted to DEP and the United States Environmental Protection Agency. A summary of the analytical results for the entire sampling program is included as Appendix A as a series of detailed site plans.

The investigations identified some probable sources and provided the analytical data to define the horizontal and vertical limits of contamination in sufficient detail to allow for the identification and evaluation of remedial alternatives. Appendix A contains an overview of the delineation of the extent of PCBs in soil and sediment within and immediately surrounding Willow Brook and Willow Brook Pond.

2.1 Initial Site Characterization Investigation

On February 13, 1998, LEA prepared a report entitled *Phase I: Report on PCB Investigation for Willow Brook and Willow Brook Pond Sediment*. The purpose of this report was to present the findings of the PCB investigation conducted on Willow Brook and Willow Brook Pond sediment in order to address the requirements of item (1) of the third paragraph of the NOV, No. PCB 97-08 issued by the DEP and dated November 7, 1997. The sampling was performed in accordance with the *Work Plan for Willow Brook and Willow Brook Pond PCB Investigation*, prepared by LEA and dated December 12, 1997, and approved by the DEP on December 22, 1997.

The report describes the field activities performed based on a predetermined sampling grid and presents the analytical results of the investigations. A Toxic Substances Control Act (TSCA) sampling grid was developed to specify the number and location of samples for the investigation in accordance with USEPA's guidance document entitled *Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup*. Two separate sampling grids were prepared for the east and west surface water bodies of Willow Brook Pond. The sampling was performed in accordance with the approved Work Plan, with the exception that the pond was not drained in response to DEP's concerns about sediment disturbance. Detectable PCB values on the sediment samples collected ranged up to a maximum concentration of 617 ppm total PCBs at sampling point WT-SD-33, located immediately downgradient of the subsurface connector between the eastern and western surface water bodies comprising Willow Brook Pond. Relatively high PCB concentrations were also observed in sediment samples collected in the vicinity of this location in both water bodies. Relatively elevated PCB concentrations were also observed along Willow

Brook immediately downstream of Willow Brook Pond. A total PCB concentration of 327 ppm was observed in the sediment at location WT-SD-52. The results of the investigations indicated the presence of elevated PCB concentrations throughout Willow Brook Pond and in the section of Willow Brook between the pond and Main Street. The PCB concentrations observed beyond that point were below 1 ppm.

Selected sediment samples were also analyzed for volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and the RCRA eight metals (arsenic, barium, cadmium, chromium, mercury, lead, silver, selenium) plus nickel and zinc.

Among the limited sediment samples analyzed for these parameters, elevated levels of SVOCs were detected in the sediment at location WT-SD-47 in the eastern water body of Willow Pond. Some of the highest SVOC concentrations reported in that sample included pyrene (480 mg/kg), phenanthrene (514 mg/kg), fluoranthene (537 mg/kg), chrysene (232 mg/kg), etc. Some of the highest metal concentrations observed in this location included lead (153 mg/kg), zinc (152 mg/kg), barium (37.7 mg/kg), and nickel (36.4 mg/kg), etc. The only VOC compounds identified in this location included trichloroethylene (23 mg/kg), tetrachloroethylene (11.6 mg/kg), 1,1,1-trichloroethane (9.7 mg/kg), and 1,1-dichloroethane (10 mg/kg). Generally lower SVOC and VOC concentrations were observed in the other locations samples.

Elevated TPH concentrations were observed at WT-SD-47 (1,160 mg/kg) and WT-SD-09 (4,340 mg/kg and 3,930 mg/kg in the duplicate). Relatively elevated metal concentrations were also observed at this location (zinc 772 mg/kg and 689 mg/kg in the duplicate, nickel 595 mg/kg and 593 mg/kg in the duplicate, lead 714 mg/kg and 691 mg/kg in the duplicate, chromium 490 mg/kg and 497 mg/kg in the duplicate).

It should be noted that no sediment was encountered in upstream accessible locations within the Willow Brook conduit to allow sample collection. Several manholes along the subsurface conduit were opened to confirm no sediment had accumulated within the conduit. Historical measurements have indicated non-detectable PCB levels in sediment samples collected from upstream brook locations, upstream of the conduit.

Based on the results obtained, additional investigations were determined to be necessary to better characterize the vertical extent of the contamination within Willow Brook and Willow Brook Pond and to identify potential nearby sources of contamination.

2.2 Supplemental Site Characterization Investigation – Phase II

In April 1998, LEA published a report entitled *Phase II: Report on Supplemental PCB Investigation for Willow Brook and Willow Brook Pond*. The purpose of this report was to present the findings of the supplemental PCB investigation conducted on Willow Brook and Willow Brook Pond. The supplemental soil and sediment sampling was performed to identify potential nearby sources of contamination and to provide information of the vertical extent of the contamination within Willow Brook and Willow Brook Pond. An overview of the results of the investigation is presented in the following paragraphs.

Southwestern Bank of Willow Brook Pond: This area was investigated to determine if infiltration or seepage from historic sludge drying beds located to the south of Willow Brook Pond was a potential source. Four soil borings were installed at the southwestern bank of Willow Brook Pond downgradient of the historic sludge drying beds. The borings were advanced to a depth of 20 to 24 feet from the western bank of the pond. Low total PCB concentrations (up to about 2 ppm) were detected in the borings installed along the southwestern bank of Willow Brook Pond. These concentrations did not appear to be indicative of a source of PCB contamination.

Area of Former Oil Basin, Western Section of Willow Brook Pond: This area was investigated to determine if infiltration or seepage from historic operations in the pond area was a potential source. The existing oil-water separator is currently operating in this area. Four soil borings were installed in the vicinity of the area of the Former Oil Basin, the small embayment west of the Process Water Facility and south of the lower section of Willow Brook Pond. Two of these borings were installed on top of the bank immediately to the south of the area of the Former Oil Basin using a Geoprobe®. These soil borings were advanced and sampled to a depth of 20 to 24 feet. The other two were installed by hand auger techniques to a depth of 2 to 8 feet in the immediate proximity of the existing oil/water separator. PCBs were detected in the soils collected from the four soil borings. However, the highest total PCB concentrations were of the order of 1.3 ppm. These concentrations do not appear to be indicative of a source of contamination.

Former Oil/Water Separator: This area was investigated to determine if infiltration or seepage from historic operations in the Pond area was a potential source. Five soil borings were installed in the vicinity of the Former Oil/Water Separator in between the two sections of Willow Brook Pond to identify potential historic sources of PCB contamination. The soil borings were installed using a Geoprobe®. These soil borings were advanced and sampled to a depth of approximately 20 feet. Soil samples were collected every 2 feet and screened visually for the presence of oil.

Three samples were submitted for analysis from each boring. Elevated total PCB concentrations were observed in the soil samples from this location. The total PCB concentration observed in this area ranged up to 128 ppm (location WT-SB-88) at a depth of 10 to 12 feet. Free oil was also observed in this location. However, the oil was not extracted from the soil matrix for separate analysis. The highest PCB concentrations were observed at a depth of approximately 8 to 12 feet below ground surface corresponding approximately to the depth of the water and sediment within the pond, and the approximate level of the water table in the area. These concentrations and findings from this area are indicative of a probable source. It should be noted that the contamination might have originated from multiple sources.

Sediment Sampling: In-depth sampling was also performed within the eastern and western water body of Willow Brook Pond, and along Willow Brook in the vicinity of the wetlands area, and in the wetland area within UTC/P&W's property. These samples were collected to develop at-depth profiling information. It should be noted that only surface sediment samples were collected during the initial Phase I investigation. A 5-foot core was used for collection of the sediment and underlying soil samples during Phase II. Generally, one sediment and two soil samples of the underlying soil were selected from each sampling location. Detected total PCB concentrations within the two sections of Willow Brook Pond (east and west) ranged in concentrations up to 258 ppm in the upper 0- to 2-foot interval. The highest concentration was observed in location WT-SD-72 near the effluent point from Willow Brook Pond. Approximately 73.5 ppm of total PCBs were detected at a depth interval of 2 to 4 feet in location WT-SD-78, located at the eastern portion of Willow Brook Pond. Significantly lower and/or non-detectable levels were observed at greater depths. PCB concentrations remained at detectable levels at certain locations at depths up to 8 or 12 feet. Total organic carbon (TOC) concentrations up to 162,000 mg/kg were detected in sediment samples within Willow Brook Pond (location WT-SD-75 at a depth of 0 to 2 feet).

The total PCB concentrations detected in Willow Brook in the vicinity of the wetlands area and within the wetlands for surface samples (0 to 6 inches) varied in concentration up to 299 ppm (location WT-SD-92). The total PCB concentrations observed in the at-depth samples (1.5 to 2.0 feet) were significantly lower ranging from 2.6 ppm to 5.7 ppm.

Additional investigations were then proposed, focusing on the areas where the highest levels of PCB contamination were identified to further investigate and define the extent of contamination.

2.3 Supplemental Site Characterization Investigation – Phase III

In April 1999, LEA prepared a report entitled *Phase III: Report on PCB Investigation for Willow Brook and Willow Brook Pond*. The purpose of this report was to present the findings of

the third phase of PCB investigations in Willow Brook and Willow Brook Pond. During this phase, soil samples were collected from soil borings and monitoring wells installed in the vicinity of Willow Brook Pond. In addition, surface sediment and soil samples to depths of up to 6 feet were collected along the banks of Willow Brook. Soil/sediment samples were collected from the wetland area at Willow Arms and from other adjacent residential properties along the portion of Willow Brook, which lies downstream of Willow Brook Pond and to the east of Main Street. Groundwater sampling was also performed in monitoring wells installed at the perimeter of Willow Brook Pond.

Willow Brook Pond Perimeter Sampling: Twelve soil borings and eight monitoring wells were installed in the vicinity of Willow Brook Pond to assess the lateral extent of the contamination. The borings and monitoring wells were installed using a Geoprobe® to a depth of approximately 20 feet. Hand auger borings to an approximate depth of 12 feet were installed in locations inaccessible by the Geoprobe®. Soil samples were collected every 2 feet and screened visually for the presence of oil. Three samples were submitted for PCB analysis from each boring, including the most contaminated one, based on visual observations, and random ones corresponding approximately to the depth of contamination obtained during the previous investigation. Total PCB concentrations of 50.87 ppm were observed to the east of the eastern water body at Willow Brook Pond, along the reinforced concrete pipe that conveys flow from Willow Brook into Willow Brook Pond. Relatively elevated PCB concentrations up to 14.33 ppm were observed in the area of the Former Oil-Water Separator between the two sections of Willow Brook Pond. This is consistent with previous findings and assists in delineating the contamination in this area. Elevated concentrations of semi-volatile organic compounds (SVOCs) and select metals have been observed at some locations. The elevated compounds are consistent and appear to be co-located with the elevated PCB concentrations.

PCBs may have seeped into nearby soils at certain locations, for example at location WT-PZ-140 to the north of the larger water body of Willow Brook Pond (3.82 ppm). However, concentrations detected at depth are generally much lower or below detectable levels. The contamination was confirmed to be primarily contained within Willow Brook Pond.

Wetlands and Stream Bank Sampling: Soil/sediment samples were collected from several abutting residential properties along the segment of Willow Brook between Willow Brook Pond and Main Street. The samples were collected at different elevations along the bank of the brook to assess the lateral extent of contamination. Samples were also collected from the wetlands area at the Willow Arms property and from the adjacent portion of UTC/P&W's property. Surface soil/sediment samples were collected in a total of 28 locations. In seven of these locations, hand auger borings were advanced to approximately 6 feet to assess the vertical extent of

contamination. Relatively elevated PCB concentrations (up to 596.2 ppm) were observed within the wetland area. Relatively elevated SVOC and select metals concentrations were also observed within this area, and, as stated before, are consistent and co-located with elevated PCB concentrations. The total PCB concentrations typically decrease to less than 1 ppm at a depth of 4 to 6 feet below grade. Similar concentrations were observed in the wetland area within UTC/P&W property. Total PCB concentrations up to 21.77 ppm were detected from sediment within Willow Brook in the off-site properties (downstream of the wetland area). The PCB concentrations observed drop substantially at higher elevations along the bank of Willow Brook, indicating that the contamination is confined within the brook and the wetland. PCB concentrations decrease to less than 1 ppm prior to Main Street.

Groundwater Sampling: LEA personnel collected groundwater samples from the installed monitoring wells during two separate sampling events (December 4, 1998 and February 10, 1999). During the December 4, 1998 sampling event, samples were collected from WT-PZ-124, WT-PZ-129, WT-PZ-131, WT-PZ-134, WT-PZ-136, WT-PZ-139, WT-PZ-140, and WT-PZ-142 using a peristaltic pump and dedicated polyethylene tubing. PCBs were only detected at two locations, monitoring wells WT-PZ-136 [8.5 parts per billion (ppb)] and WT-PZ-139 (0.73 ppb). These wells are in the vicinity of locations where the highest PCB concentrations in soil have been detected.

The second round of groundwater monitoring was performed to supplement the first round in which certain analyses were not performed due to sample breakage while in transit to the laboratory and to provide additional monitoring data on all parameters detected during the initial round. During the February 10, 1999 sampling event, samples were collected from WT-PZ-124, WT-PZ-129, WT-PZ-131, WT-PZ-134, WT-PZ-136, WT-PZ-139, WT-PZ-140, and WT-PZ-142 using a peristaltic pump and dedicated polyethylene tubing. The data from the second round generally confirmed the results of the previous round as PCBs were detected at the same two locations. PCBs were detected in groundwater from monitoring wells WT-PZ-136 (7.9 ppb) and WT-PZ-139 (1.7 ppb).

Surface Water Sampling: Surface water samples were collected from two locations at Willow Brook Pond (at the pumps from the larger water body prior to entering the facility for non-contact cooling water use and at the dam) and from Willow Brook (downstream of Willow Brook Pond at the intersection with Main Street). No PCBs were detected in any of the surface water samples collected.

2.4 Nature and Extent of Contamination

2.4.1 Soil and Sediment

Overall and with consideration of the data collected to date, PCB concentrations are generally distributed in the brook and pond sediments gradually decreasing in concentration in the downgradient direction. This decrease trends from > 100 ppm in the pond and wetland areas to a concentration of < 1 ppm at Main Street. PCBs were also found in the soils between the two ponds, where the former oil/water separator was located. The vertical extent of PCB impacts has been defined by the sampling conducted, generally achieving non-detect or concentrations < 1 ppm at depths ranging from 4 to 6 feet below grade in the wetlands area and 14 to 16 feet below grade in the area between the eastern and western section of the pond. Soil samples collected along and up the banks of the brook and ponds define the horizontal limits of PCB to non-detect or concentrations of < 1 ppm. Appendix A contains drawings depicting the extent of PCB impact in the Willow Brook and Willow Brook Pond area. SVOCs and select metals are co-located with the elevated PCB concentrations.

2.4.2 Groundwater

Groundwater samples collected during the investigations identified only two locations where PCBs were detected in groundwater at concentrations exceeding the analytical reporting limits (WT-PZ-136 and WT-PZ-139). Well WT-PZ-136 is located in the immediate vicinity of the former oil/water separator and locations of high PCB content in soil. Well WT-PZ-139 is adjacent to an area of elevated PCB in soils.

2.4.3 Surface Water

Surface water sampling from Willow Brook and Willow Brook Pond was performed on February 6, 1998. Samples were collected from Willow Brook Pond at the pumps pumping from the larger water body and dam and from Willow Brook downstream of Willow Brook Pond at Main Street. No PCBs were detected in any of the surface water samples collected.

3. EVALUATION OF REMEDIAL ALTERNATIVES

As stated in Section 2, an adequate level of investigation has been performed to allow for the identification and evaluation of alternatives to address soil and sediment contaminated with PCBs, semi-volatile organic compounds, petroleum hydrocarbons and select metals within and immediately surrounding Willow Brook and Willow Brook Pond. For the purposes of this request, the following section presents an evaluation of two alternatives to address the identified contamination. The alternatives presented are:

1. The complete excavation and removal of contaminated soil and sediment exceeding 1 ppm PCBs within the Willow Brook Pond project limits as defined in Section 1.1;
2. The excavation and offsite disposal of soil and sediment from within and immediately surrounding Willow Brook and Willow Brook Pond that contains PCBs at concentrations greater than 25 ppm (1 ppm in a 1-acre wetland and in the southwestern portion of the lower section of Willow Brook Pond) and the placement of an engineered control over the entirety of the Willow Brook and Willow Brook Pond (with the exception of the 1-acre wetland) within project limits as defined in Section 1.1.

3.1 Complete Excavation and Offsite Disposal

The proposed construction activities involve:

- The demolition of the existing process water facility building structures and the offsite disposal of construction demolition debris;
- The removal and offsite disposal of an oil/water separator and the excavation and offsite disposal of soil containing concentrations of PCBs in excess of 1 ppm and, SVOCs, TPH and select metals in excess of commercial/industrial direct exposure criteria (IDEC) and GB pollutant mobility criteria (GBPMC) in the vicinity of the oil/water separator;
- The excavation and offsite disposal of approximately 36,800 cubic yards of soil and sediment containing total PCBs at concentrations greater than 1 ppm from within and immediately surrounding the Willow Brook and Willow Brook Pond;
- The placement of granular backfill within excavation areas to restore the site to existing grade;
- The restoration of an approximately 1-acre wetland located downstream of the Willow Brook Pond Dam; and



- The implementation of an institutional control consisting of a deed restriction to ensure the affected area will not be used for residential purposes.

The following parts of this section describe in general each of the anticipated construction activities necessary to complete under this alternative. Figure 3-1 presents the approximate limits of the planned excavation. Figure 3-2 presents the planned surface restoration activities.

3.1.1 Demolition and Removal of Existing Structures

As part of the remedial activities, select buildings and other structures will be demolished (see Figure 3-1). A list and description of the primary structures to be demolished are as follows:

- Five buildings and components associated with the process water facility; and
- The abandoned underground oil/water separator located between the upper and lower sections of Willow Brook Pond.

Prior to demolition, a complete survey of the structures and their components will be performed. The survey is necessary to determine decommissioning, demolition, and disposal requirements. UTC/P&W will be responsible for shutdown and removal of components they intend to reuse from the process water facility.

Process Water Buildings: Demolition of the process water buildings will extend to a depth necessary to achieve the project objectives of removal of soil and sediment containing total PCBs in excess of 1 ppm. Other related structures, such as pilings, erosion structures, etc., will also be demolished and removed to a depth necessary to achieve the project objectives. Pipes and utilities connected to these buildings will be abandoned during the demolition activities or during the soil and sediment removal phase of the project.

Former Oil/Water Separator: A buried oil/water separator is located between the upper and lower sections of Willow Brook Pond. This structure and surrounding soils are contaminated with PCBs. The oil/water separator, its contents, and the impacted soil containing PCBs at concentrations greater than 1 ppm surrounding the structure will be completely removed and disposed of at an offsite location during the project. Prior to removal of the structure, the oil/water separator will be exposed and any remaining contents will be removed, characterized, and disposed of at an offsite location.

3.1.2 Contaminated Soil and Sediment Excavation and Offsite Disposal

It is anticipated that approximately 36,800 cubic yards of contaminated soil and sediment will be excavated and disposed of at an offsite location during the project. In general, soil and sediment



excavated, as part of the remediation will be stockpiled in a staging area and stabilized with clean sand to eliminate free-draining water. Details of stream flow management during construction, dewatering and excavation methods have been presented in Section 2.3 of the May 2001 revision of the November 2000 Remedial Action Work Plan.

The excavation program will advance from upstream to downstream within Willow Brook Pond and the Willow Brook streambed. The approximate horizontal limits of the soil and sediment removal activities are presented on Figure 3-1. Based on the prior investigations, it is anticipated that an average of 4 feet of sediment will be removed from the pond and brook and up to 6 feet within the wetland area. Soil from depths of up to 16 feet will be excavated in the vicinity of the oil/water separator. Confirmatory soil samples collected during the remediation will provide the final horizontal and vertical limits of excavation. The soil and sediment excavation will be accomplished through the use of track-mounted excavators, bulldozers, and loaders. It is likely that some or all of the equipment will be of a low ground pressure configuration to allow operation within the pond and stream channel.

3.1.3 Site Restoration

Following the excavation and demolition activities, Willow Brook and Willow Brook Pond will be restored. The site restoration involves the backfilling of Willow Brook and Willow Brook Pond to match existing grades, the placement of a 6-inch thick layer of 4-inch stone within Willow Brook Pond, and the placement of a 12-inch thick layer of 6-inch stone within the Willow Brook stream channel. The wetland north of Willow Brook will be restored by providing a soil and wetland sediment cap consisting of 24 inches of process gravel, and 12-inches of wetland soil. The wetland will be planted with native wetland plants. It is anticipated that restoration activities for areas outside the waterway and wetland will consist of the installation of paved parking areas or grassed areas. Planned final site restoration under this alternative is presented in Figure 3-2.

The future site use options may consist of the following:

- Additional automobile and/or truck parking; and
- Relocation/rerouting of Willow Street to the northern portion of the property as indicated on Figure 3-3.



3.1.4 Capital Cost

Provided, as Appendix B, is a detailed estimate of the capital cost for the implementation of the completed excavation and offsite disposal alternative. As detailed in Appendix B, the cost for the implementation of this alternative is \$9,265,888. The cost for a single year of post-remediation groundwater monitoring is estimated at \$20,000. This is based on the collection of groundwater samples from six locations on a quarterly basis, the analysis of the groundwater samples for volatile organic compounds, the RCRA 8 metals plus copper, nickel, and zinc, extractable petroleum hydrocarbons, and PCBs, and the preparation of a single annual report evaluating the groundwater monitoring data from the four previous quarters. For the purposes of evaluation of overall costs of this alternative, it has been assumed the groundwater monitoring will be performed for a period of 5 years. The estimated present worth cost of the groundwater monitoring program (assuming an interest rate of 4 percent) is \$89,000 bringing the total cost of this alternative to \$9,354,888.

3.2 Partial Excavation and Installation of Engineered Control

This alternative has been presented in detail in the May 2001 revision to the November 2000 Remedial Action Work Plan. The proposed construction activities involve:

- The excavation and installation of a temporary lined by-pass channel with inlet and outlet structures;
- The demolition of the existing process water facility building structures and the offsite disposal of construction demolition debris;
- The removal and offsite disposal of the former oil/water separator located between upper and lower Willow Brook Pond and the excavation and complete removal of the structure with offsite disposal of impacted soil and concrete and the placement of an engineered control to achieve compliance with the variance provisions in the RSR;
- The excavation and offsite disposal of approximately 8,500 cubic yards of soil and sediment containing total PCBs at concentrations greater than 25 ppm from within and immediately surrounding Willow Brook and Willow Brook Pond;
- The excavation and offsite disposal of approximately 1,500 cubic yards of soil and sediment containing PCBs at concentrations between 1 and 25 ppm from within and immediately surrounding the wetland area located north of Willow Brook;
- The excavation and offsite disposal of approximately 2,500 cubic yards of soil and sediment from within the open channel of Willow Brook to allow for the installation of the geotextile, soil, and stone cap within the stream channel;
- The placement of a geotextile, soil and stone cap (engineered control) over the entirety of the excavated area (with the exception of an approximately 1-acre wetland described below) to isolate sediment containing less than 25 ppm total PCBs commingled with semi-volatile organic compounds, petroleum hydrocarbons, and select metals to achieve compliance with the variance provisions in the RSR;



- The restoration of an approximately 1-acre wetland located downstream of the Willow Brook Pond Dam; and
- The implementation of two institutional controls consisting of 1) a deed restriction to ensure the affected area will not be used for residential purposes and to prohibit excavation; and 2) installation of a fence around the entire area to preclude access to Willow Brook and Willow Brook Pond.

3.2.1 Demolition and Removal of Existing Structures

As part of the remedial activities, select buildings and other structures will be demolished (see Figure 3-4). A list and description of the primary structures to be demolished are as follows:

- Five buildings and components associated with the process water facility; and
- The former underground oil/water separator located between the upper and lower sections of Willow Brook Pond.

The activities to be carried out under this alternative are, with one exception, identical to those presented for the complete excavation alternative. The single exception is with regard to the extent of removal activities. Under this alternative, soil and sediment containing total PCBs in excess of 25 ppm will be removed, rather than the 1 ppm limit established for the complete excavation alternative.

3.2.2 Contaminated Soil and Sediment Excavation and Offsite Disposal

It is anticipated that approximately 12,500 cubic yards of contaminated soil and sediment will be excavated and disposed of at an offsite location during the project. In general, soil and sediment excavated, as part of the remediation will be stockpiled in a staging area and stabilized with clean sand to eliminate free-draining water. Details of stream flow management during construction, dewatering and excavation methods have been presented in Section 2.3 of the May 2001 revision of the November 2000 Remedial Action Work Plan.

The excavation program will advance from upstream to downstream within Willow Brook Pond and the Willow Brook streambed. The approximate horizontal limits of the soil and sediment removal activities are presented on Figure 3-4. Based on the prior investigations, it is anticipated that an average of 2 to 3 feet of sediment will be removed from the pond and brook and up to 6 feet within the wetland area. Soil from depths of up to 16 feet will be excavated in the vicinity of the oil/water separator. Confirmatory soil samples collected during the remediation will provide the final horizontal and vertical limits of excavation. The soil and sediment excavation will be accomplished through the use of track-mounted excavators, bulldozers, and loaders. It is



likely that some or all of the equipment will be of a low ground pressure configuration to allow operation within the pond and stream channel.

3.2.3 Site Restoration

Following the excavation and demolition activities, Willow Brook and Willow Brook Pond will be restored. The planned restoration activities are described in detail below and depicted on Figure 3-5. The site restoration involves the installation of 3 types of caps (engineered controls) over soil and sediments remaining following excavation and removal of those containing total PCBs at concentrations greater than 25 ppm. The cap details were derived based on the anticipated stream flow velocities and considered the ultimate use of the area as a combined wetland, pond, and stream channel. The base of each cap consists of a non-woven geotextile, a 9-inch layer of organic rich soil, and a non-woven geotextile. This layer is referred to below as an organic-rich layer. This organic-rich layer is included as a contingency to mitigate any potential for PCBs to migrate vertically upward through the proposed soil and rock cap. Each engineered control is described below and are depicted on Figures 3-6 through 3-8.

- Within Willow Brook Pond, a 36-inch soil and stone cap is proposed (refer to Figure 3-6). The cap will consist of a 9-inch organic rich layer, 21 inches of process gravel, and a 6-inch layer of 4-inch stone. As the flow velocity in Willow Brook Pond is extremely low and is controlled by the dam at the outlet to the pond, the stone lining will provide adequate protection against erosion.
- Within Willow Brook (downstream of the dam), a 36-inch soil and stone cap is proposed (refer to Figure 3-7). The cap will consist of a 9-inch organic rich layer, a 15-inch layer of modified riprap and a 12-inch layer of cobbles, gravel and coarse sand. The 15-inch layer of modified riprap extends the width of the channel bottom and transitions into a 24-inch layer of intermediate riprap on the side slopes of the channel banks. The 24-inch layer of modified riprap extends up the channel banks to the elevation of the 10-year flood. The riprap channel lining has been designed to withstand the erosive forces anticipated in the stream channel following completion of the construction project.
- The area of the underground oil/water separator will be provided with a composite cap (refer to Figure 3-7). The composite cap will consist of a 40-mil flexible membrane liner, a geotextile drainage layer, 30-inches of granular backfill, and a 6-inch loam and seed layer.

In addition to the above, the wetland north of Willow Brook will be restored by providing a soil and wetland sediment cap consisting of 24 inches of granular fill, and 12-inches of wetland soil. The wetland will be planted with native wetland plants (refer to Figure 3-8).

Following restoration activities, UTC/P&W will implement two institutional controls to ensure the long-term protectiveness of the proposed remedy. The institutional controls consist of 1) a deed restriction to ensure the affected area will not be used for residential purposes and to prohibit excavation and 2) installation of a fence around the entire area to preclude access to Willow Brook and Willow Brook Pond (refer to Figure 3-5).

In the event that redevelopment of this area involves a bike path or roadway, UTC/P&W will remediate the areas directly beneath those uses to 1 ppm.

3.2.4 Capital Cost

Provided, as Appendix C, is a detailed estimate of the capital cost for the implementation of the partial excavation and installation of engineered control alternative. As detailed in Appendix C, the capital cost for the implementation of this alternative is \$5,846,260. The post-remediation groundwater monitoring program to be implemented following the construction of this alternative is detailed in Appendix D. The cost for the implementation of a single year of post-remediation groundwater monitoring is estimated at \$26,000.

In addition, under this option it will be necessary to maintain the engineered control. The costs for maintaining the engineered control are those associated with:

- Regular mowing and maintenance of the area surrounding Willow Brook and Willow Brook Pond (assumed to be 3 acres mowed 20 times per year);
- Annual visual inspection of the stream channel of Willow Brook to ensure the rip-rap channel lining has not been impacted; and
- Annual inspection, via probing, of the bottom of Willow Pond to ensure the stone layer has not been eroded.

It has been anticipated that onsite UTC/P&W maintenance personnel and existing landscape contractors will be engaged for the purposes of performing the above maintenance activities. The annual cost for the implementation of the above maintenance program, including the preparation of an annual report documenting the maintenance activities, is estimated to be \$3,500.

For the purposes of evaluation of overall costs of this alternative, it has been assumed the maintenance and groundwater monitoring will be performed for a period of 30 years. The estimated present worth cost of the maintenance and groundwater-monitoring program



(assuming an interest rate of 4 percent) is \$505,040 bringing the total cost of this alternative to \$6,351,300.

3.3 Cost Comparison

In accordance with Section 22a-133k-2(f)(2)(A)(iv) of the RCSA, a determination must be made that the “cost of remediating the polluted soil at such release area is significantly greater than the cost of installing and maintaining an engineered control for such soil and conducting ground-water monitoring at such release area in accordance with subsection (g) of section 22a-133k-3”. The cost for the complete excavation and offsite disposal alternative is approximately \$9,354,888. The cost for the implementation of the partial excavation and offsite disposal and engineered control alternative inclusive of operation and maintenance is approximately \$6,351,300. Based on the discussions above and the detailed evaluation of costs for each alternative, it is concluded that the complete excavation alternative is significantly more expensive than the partial excavation and engineered control alternative and the additional cost is not commensurate with environmental benefit.



4. DESIGN, MANAGEMENT AND ADMINISTRATIVE REQUIREMENTS

This section details design, management and administrative requirements set forth in Section 22a-133k-2(f) of the RCSA. Specifically, this section provides a direct regulatory citation and the activities that will be undertaken to satisfy that requirement.

4.1 Design of Engineered Control

In accordance with Section 22a-133k-2(f)(2)(B)(i)(aa) of the RCSA “The proposed engineered control is designed and will be constructed to physically isolate polluted soil and to minimize migration of liquids through soil, to function with minimum maintenance, to promote drainage and minimize erosion of or other damage to such control, and to accommodate settling and subsidence of the underlying soil so as to maintain the control's structural integrity and permeability”.

The engineered control to be installed as part of this project consists of two sub aqueous caps (see Figure 3-6 for Willow Brook and Willow Brook Pond cap details) and a cap to be installed in the area of the former oil water separator. Each of the caps has been designed to physically isolate polluted soils by providing a minimum separation distance of 36 inches. The cap to be installed in the vicinity of the former oil water separator has also been designed to minimize infiltration of precipitation to the underlying polluted soil. With regard to Willow Brook and Willow Brook Pond, the caps are sub aqueous and, in an effort to minimize the potential for alteration of the current hydrology of the area, are permeable. The caps for Willow Brook and Willow Brook Pond have been designed to include a 9-inch organic-rich layer. This organic rich layer was added as a contingency to mitigate any potential for PCBs to migrate vertically upward through the proposed soil and rock cap. This layer will act as a sorbent media to minimize the potential for underlying groundwater that is in contact with contaminated soils to pass through the control and impact the overlying surface water.

By design, each of the caps comprising the engineered control will function with minimal maintenance. The cap installed in the vicinity of the former oil/water separator will require frequent mowing during the growing season. The cap within Willow Brook and Willow Brook Pond will, by design, require no maintenance unless repairs are necessary based on observations during annual inspections.

With regard to promoting drainage and minimizing erosion, the cap installed in the vicinity of the former oil/water separator will be designed to promote runoff and minimize run on. The cap will be vegetated to minimize the potential for erosion. With regard to the sub aqueous caps,



each have been designed to minimize the potential for erosion. The cap to be installed in Willow Brook has been designed to include a 24-inch layer of modified riprap extending up the channel banks to the elevation of the 10-year flood to counteract erosive forces within the stream channel. The cap to be installed in Willow Pond has been designed to include a 4-inch stone layer. As the flow velocity in Willow Brook Pond is extremely low and is controlled by the dam at the outlet to the pond, the stone lining will provide adequate protection against erosion.

With regard to accommodating settling and subsidence of the underlying soil, each of the proposed caps is flexible in nature. The cap to be installed in the vicinity of the former oil/water separator contains as its low-permeability component, a 40-mil high-density polyethylene liner. Additionally, the sub grade for this cap will be prepared to promote runoff and minimize the potential for ponding. The sub aqueous caps are composed of earthen materials and will accommodate subsidence of underlying soils. However, with regard to the sub aqueous caps, subsidence is not considered as significant factor in the design of the control as it will have no detrimental affect on the ability of the control to preclude direct human contact with the underlying contaminated soil.

4.2 Groundwater Monitoring

In accordance with 22a-133k-2(f)(2)(B)(ii) of the RCSA, “plans for ground-water monitoring at the subject release area are adequate to ensure that any substance migrating there from will be detected”. Appendix D contains a proposed post-remediation groundwater monitoring program to be implemented following the installation of the engineered control.

4.3 Maintenance of Engineered Control

In accordance with 22a-133k-2(f)(2)(B)(iii) of the RCSA, “plans for maintenance of the subject release area are adequate to ensure that the structural integrity, design permeability, and effectiveness of the engineered control will be maintained; such plans shall include without limitation measures to prevent run-on and run-off of storm water from eroding or otherwise damaging the engineered control and measures to repair such control to correct the effects of any settling, subsidence, erosion or other damaging events or conditions”. Appendix E contains a proposed post remediation maintenance and monitoring program to be implemented following the installation of the engineered control. The post remediation maintenance and monitoring will continue for the life of the engineered control.



4.4 Institutional Controls

In accordance with 22a-133k-2(f)(2)(B)(iv) of the RCSA, “an environmental land use restriction is or will be in effect with respect to the parcel at which the subject release area is located, which restriction ensures that such parcel will not be used in a manner that could disturb the engineered control or the polluted soil”.

Following restoration activities, UTC/P&W will implement two institutional controls to ensure the long-term protectiveness of the engineered control. The institutional controls consist of 1) environmental land use restrictions to ensure the affected area will not be used for residential purposes and to ensure that activities that could disturb the engineered control will not be performed; and 2) installation of a fence around the entire area to preclude access to Willow Brook and Willow Brook Pond (refer to Figure 2-2).

4.5 Financial Assurance

In accordance with 22a-133k-2(f)(2)(B)(vi) of the RCSA, “...the owner of the subject parcel shall demonstrate that he has posted or will post a surety in a form and amount approved in writing by the Commissioner, which surety during the first year after installation of the engineered control shall be equal to the cost of one year's maintenance and monitoring of the engineered control, and which in each subsequent year shall be increased in amount by adding an amount equal to the cost of one year's maintenance and monitoring, until the total amount of such surety is equal to the cost of five years of maintenance and monitoring, which amount shall be maintained in effect for the next twenty-five years or for such other period as may be required by the Commissioner.” UTC proposes to demonstrate financial assurance for the maintenance and monitoring of the engineered control by performing the RCRA TSD financial test specified in 40 CFR section 264.143(e), substituting the costs of maintaining and monitoring UTC's proposed control (as specified in RCSA section 22a-133k-2(f)(2)(B)(vi)) for the closure, post-closure and other RCRA financial test costs (as specified in the RCRA financial test). UTC's first demonstration will be submitted within 30 days after the construction of the engineered control is completed. UTC shall maintain this financial assurance for a period of twenty-five years after the construction of the engineered control is completed or any shorter period approved by the Department and, during this period, shall make the proposed demonstrations annually, on or before the anniversary of the first submission.

4.6 Public Notice

In accordance with 22a-133k-2(f)(2)(A)(iv) of the RCSA, UTC/P&W plans to public notice the proposed use of an engineered control by two of the following three methods “(i) by publication



in a newspaper of substantial circulation in the affected area; (ii) by placing and maintaining on the subject parcel, for at least thirty days, in a legible condition a sign which shall be not less than six feet by four feet which sign shall be clearly visible from the public highway; or (iii) by mailing notice to the owner of record of each property abutting the subject parcel at his address on the most recent grand tax list of the municipality or municipalities in which such properties are located.” In providing public notice, UTC/P&W will follow all requirements of Section 22a-133k-2(f)(2)(A)(iv) of the RCSA.



5. CONCLUSIONS

The comprehensive subsurface investigations resulted in sufficient information to allow for a thorough evaluation of alternatives to address contaminated soil and sediment in and immediately surrounding Willow Brook and Willow Brook Pond at the UTC/P&W facility in East Hartford, Connecticut. The alternatives considered herein included: limited excavation and offsite disposal in conjunction with an engineered control; and complete excavation and offsite disposal. Based on the evaluation detailed in Section 3 of this report, it was concluded that limited excavation and offsite disposal in conjunction with an engineered control is the most appropriate alternative to address the contaminated soil and sediment. To implement this alternative, UTC/P&W has submitted the necessary applications to obtain approvals from the Town of East Hartford Inland Wetlands Commission (approval granted April 24, 2001), Town of East Hartford Planning and Zoning Commission, the Department of Environmental Protection, the United States Army Corps of Engineers. As noted, a Remedial Action Work Plan detailing the selected alternative has been presented to the United States Environmental Protection Agency and the Department of Environmental Protection for review.

From the evaluation presented herein, it is concluded that the cost for complete excavation of the polluted soil at such release area is significantly greater than the cost of installing and maintaining an engineered control for such soil and conducting ground-water monitoring at such release area in accordance with subsection (g) of section 22a-133k-3. As detailed in Section 3, the cost for remediating the polluted soil by complete excavation, inclusive of 5 years of post-remediation groundwater monitoring is \$9,354,888. The cost for partial excavation and offsite disposal in conjunction with an engineered control, inclusive of 30 years of maintenance and groundwater monitoring is \$6,351,300.

In conclusion, the significantly greater cost of implementing a complete excavation alternative in comparison to the partial excavation and engineered control alternative (over 47 percent) is not commensurate with the benefits to human health and the environment. Specifically:

- **Risk to the environment if the engineered control fails to prevent the mobilization of contaminants in soil:** Investigations performed to date have resulted in the collection of data that substantiate the conclusion that the PCBs in soil represent an insignificant risk to groundwater as a result of mobilization in groundwater. PCBs were detected in only two locations in groundwater in the immediate vicinity of the elevated PCB concentrations in either soil or sediment. These areas would be addressed by excavation of source areas (contaminated soil and the former oil/water separator) during the implementation of the partial



excavation and offsite disposal and engineered control alternative described herein. Additional information was submitted to the DEP on April 27, 2001 that further supports this conclusion. Furthermore, groundwater monitoring will be performed around the periphery of Willow Brook and Willow Brook Pond following the installation of the engineered control to confirm that PCBs are not migrating in groundwater.

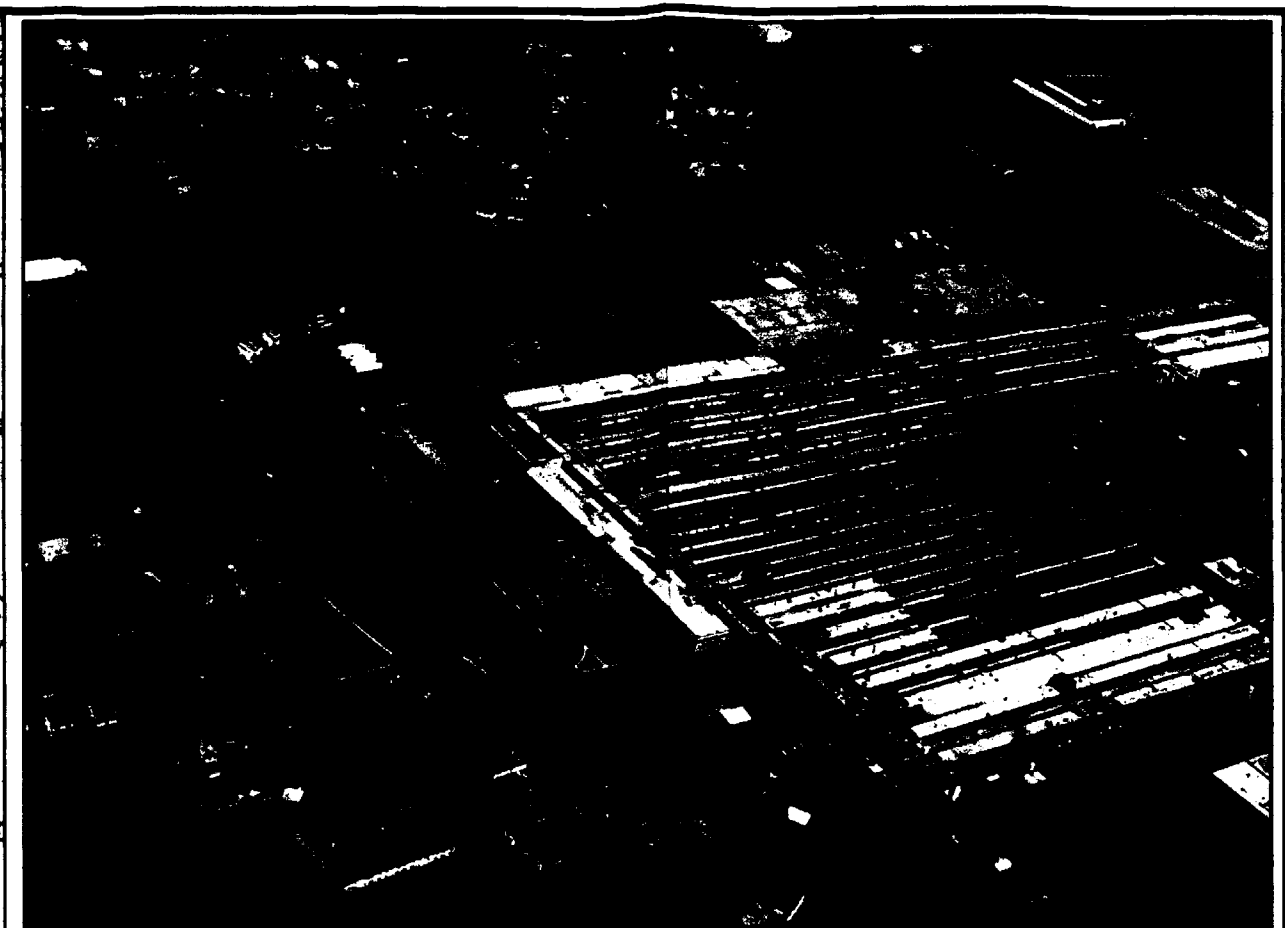
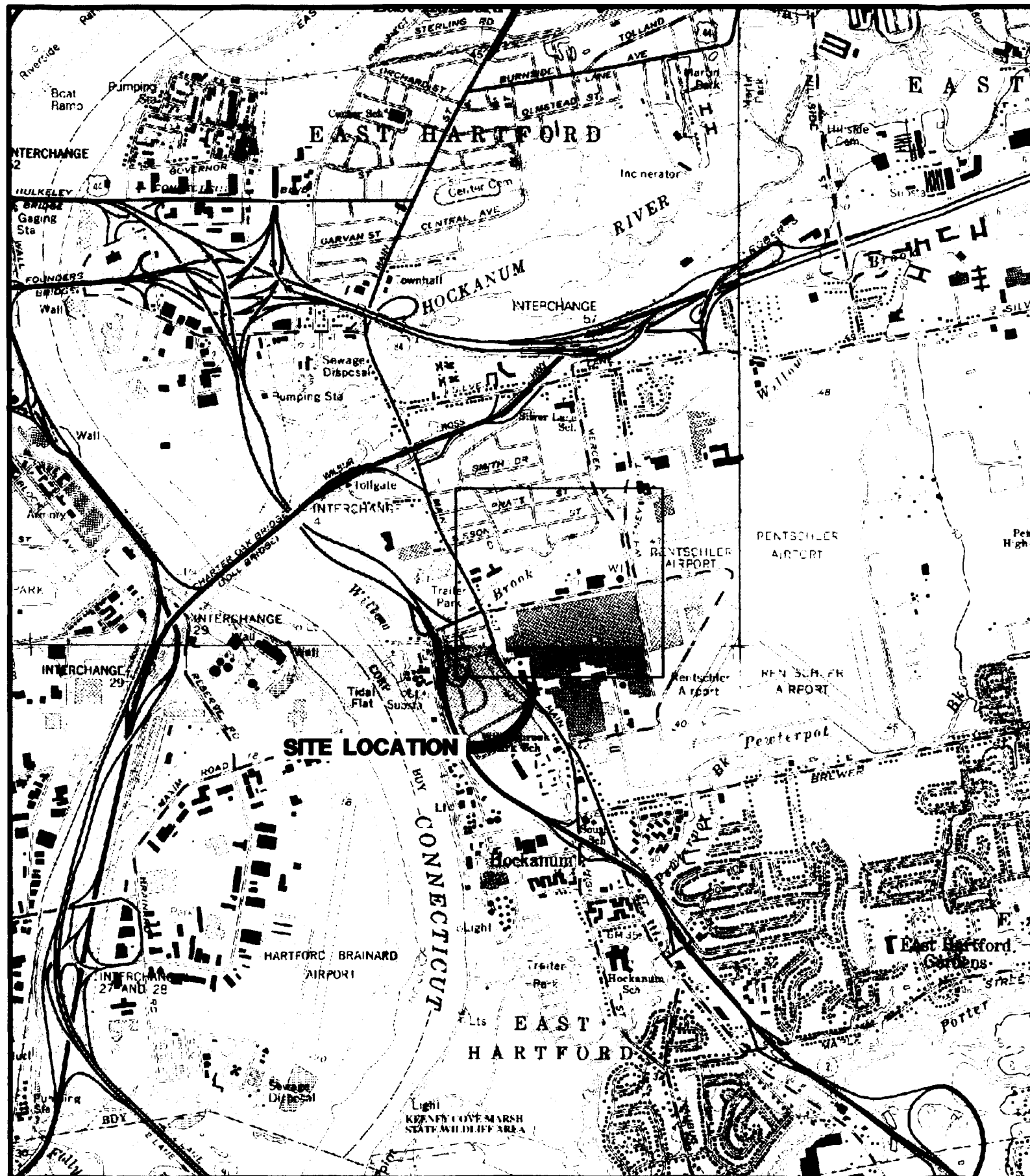
- **Risk to the environment as a result of mobilization to surface water (transport of contaminated sediment via groundwater to surface water):** This is considered an unlikely event. However, each of the sub aqueous caps is designed with a 9-inch organic layer to prevent the migration of contaminated soil through the cap section and, as detailed in Appendix D, monitoring will be performed to confirm its effectiveness. In the event the engineered control was to be eroded, the potential for soil and sediment containing residual concentrations of PCBs to be transported via surface water would exist. The potential for transport of sediment from the pond is considered very low due to the low surface water velocities within the water body. The potential for transport of sediment from Willow Brook is considerably higher in comparison to Willow Pond as surface water velocities within the brook are considerably higher. However, following remediation, the average concentration of PCBs that will remain in soil and sediment within Willow Brook and Willow Brook Pond would be approximately 5 ppm. The average concentration that would remain in Willow Brook alone is approximately 4 ppm. Though the potential for the transport of contaminated soil and sediment would exist in the event the engineered control were to be eroded, the overall risk to the environment in comparison to the risk that exists today would be significantly decreased as a result of the intended remediation approach which would result of the excavation of the most contaminated soils and sediments.
- **Risk to human health if the engineered control fails to prevent human exposure to such substance:** The engineered control has been designed to have a total thickness of 36 inches. The stone surface on each of the sub aqueous caps minimizes the potential for erosion and the potential for thinning of the cap to a point where direct human contact could be a potential. The cap installed in the vicinity of the former oil/water separator will include a flexible membrane liner and will be designed and constructed in a manner minimizing the potential for erosion. Following installation, the maintenance program detailed in Appendix E will further ensure the future integrity of the engineered control. However, in the



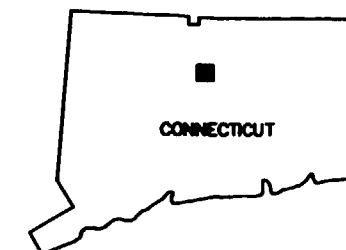
event that the engineered control was to be eroded, the potential for human exposure to contaminated soil and sediment would exist. As noted in previous sections, following remediation deed restrictions to ensure the affected area will not be used for residential purposes and to prohibit excavation of soil and sediment will be recorded for the entirety of the project area. Following remediation, the average concentration of PCBs that will remain in soil and sediment would be approximately 5 ppm. This concentration is one-half of the default numeric commercial/industrial direct exposure criteria established in the RSR.



FIGURES



NOTE: AERIAL PHOTO TAKEN ON DECEMBER 30, 1998.



Originals in color.

REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/P & W, Willow Brook & Willow Brook Pond

SITE LOCATION MAP

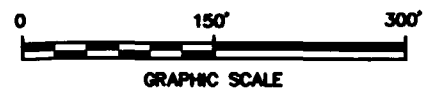
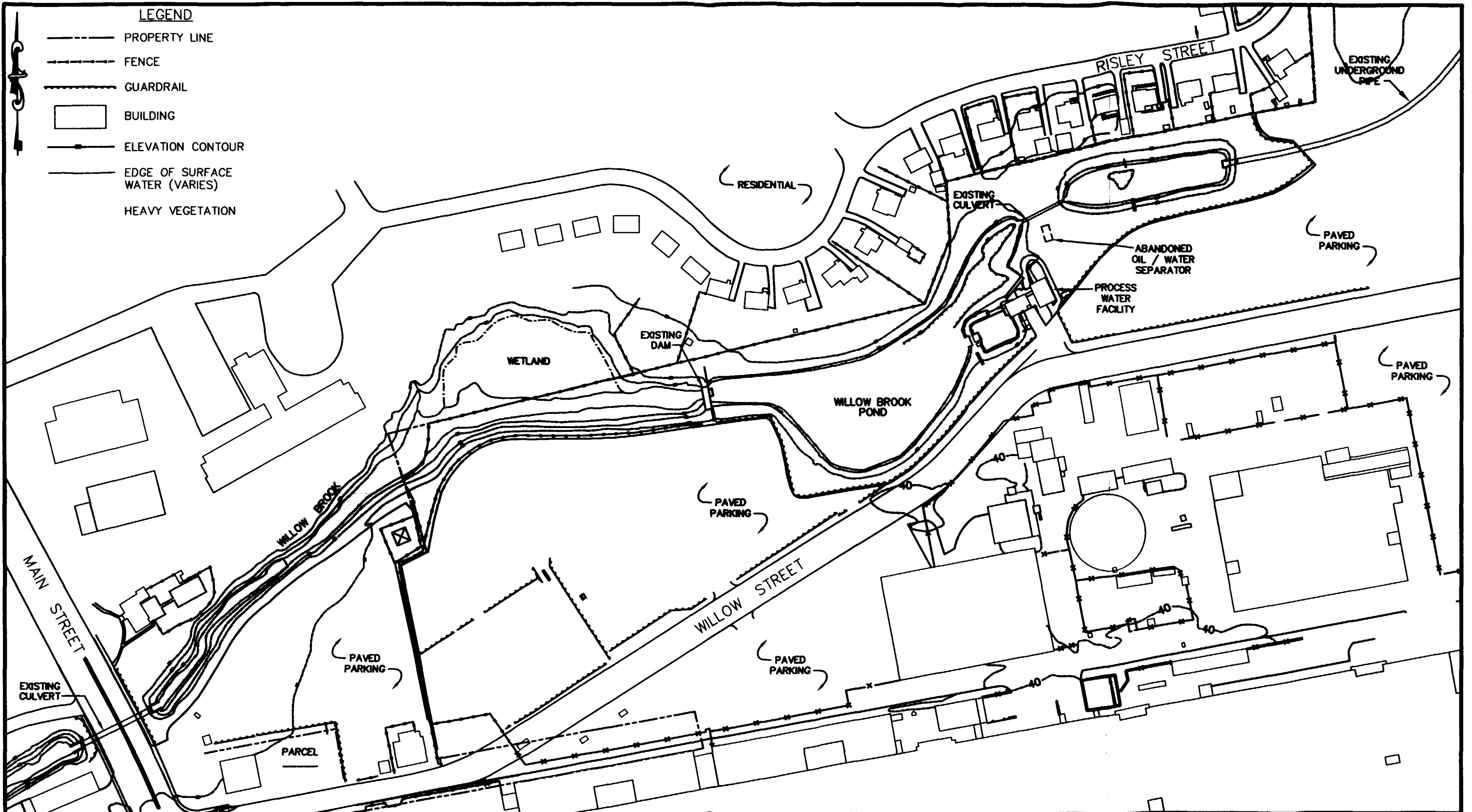
Comm.No.

88UT002.001

FIGURE 1-1



SOURCE: USGS 7.5 MIN. TOPOGRAPHIC QUADRANGLES: HARTFORD NORTH, CONN. 1984, HARTFORD SOUTH, CONN. 1984, MANCHESTER, CONN. 1983, AND GLASTONBURY, CONN. 1984. ALL PHOTOREVISED IN 1992.



NOTES:

1. BASE MAP FROM ELECTRONIC FILE OF LOUREIRO ENGINEERING ASSOCIATES, P.C. DRAWING, DATED 12/1/98 AND FROM USGS AERIAL PHOTOGRAPHY, 1994.

Original includes color coding.

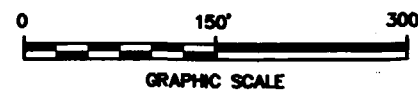
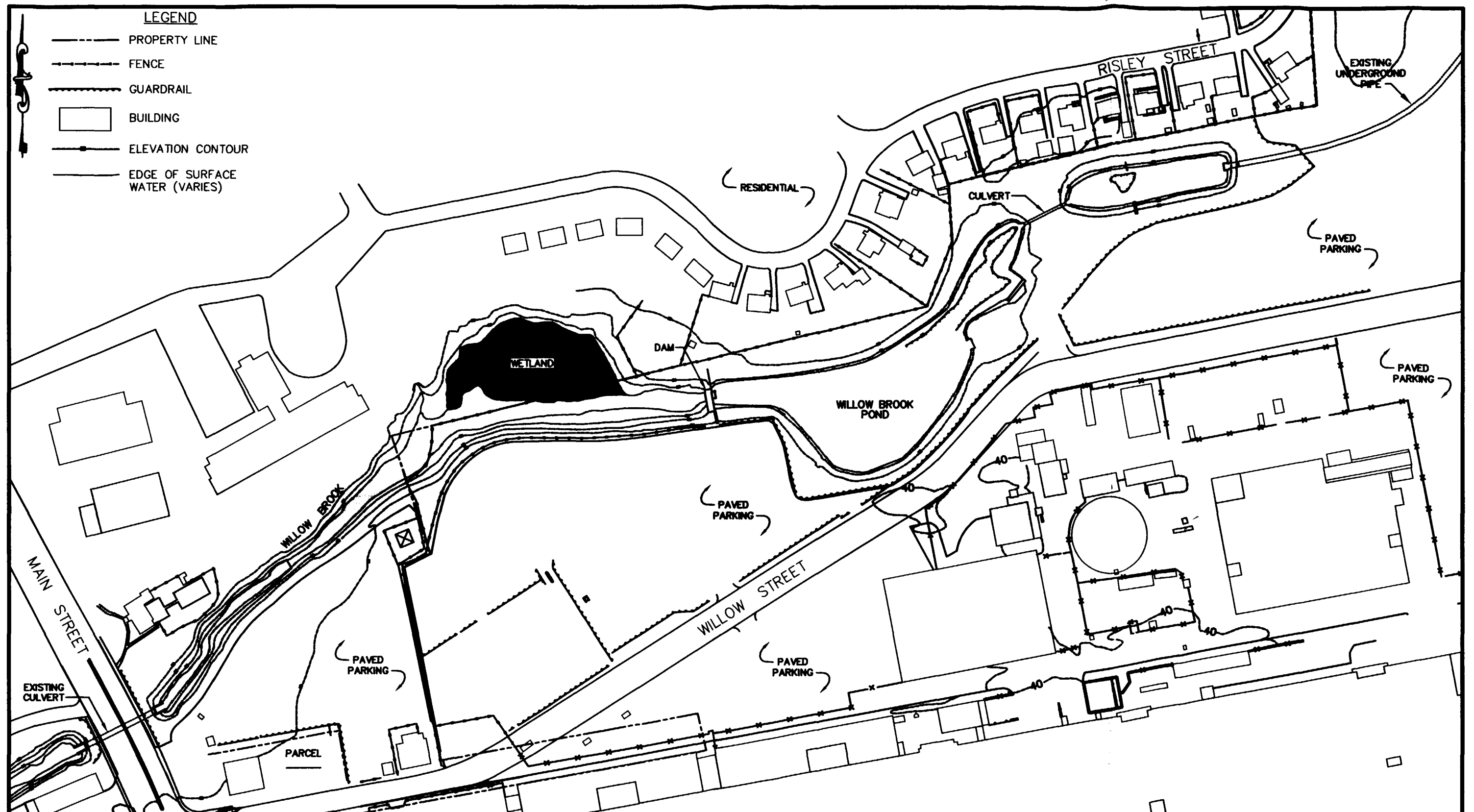
REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/V & W. Willow Brook & Willow Brook Pond

EXISTING SITE PLAN

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FIGURE 1-2





NOTES:

1. BASE MAP FROM ELECTRONIC FILE OF LOUREIRO ENGINEERING ASSOCIATES, P.C. DRAWING, DATED 12/1/96 AND FROM USGS AERIAL PHOTOGRAPHY, 1994.

Original includes color coding.

REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/P & W, Willow Brook & Willow Brook Pond

**SITE RESTORATION
COMPLETE EXCAVATION ALTERNATIVE**

Comm.No.





88UT002.001

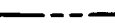


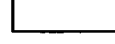


FIGURE 3-2

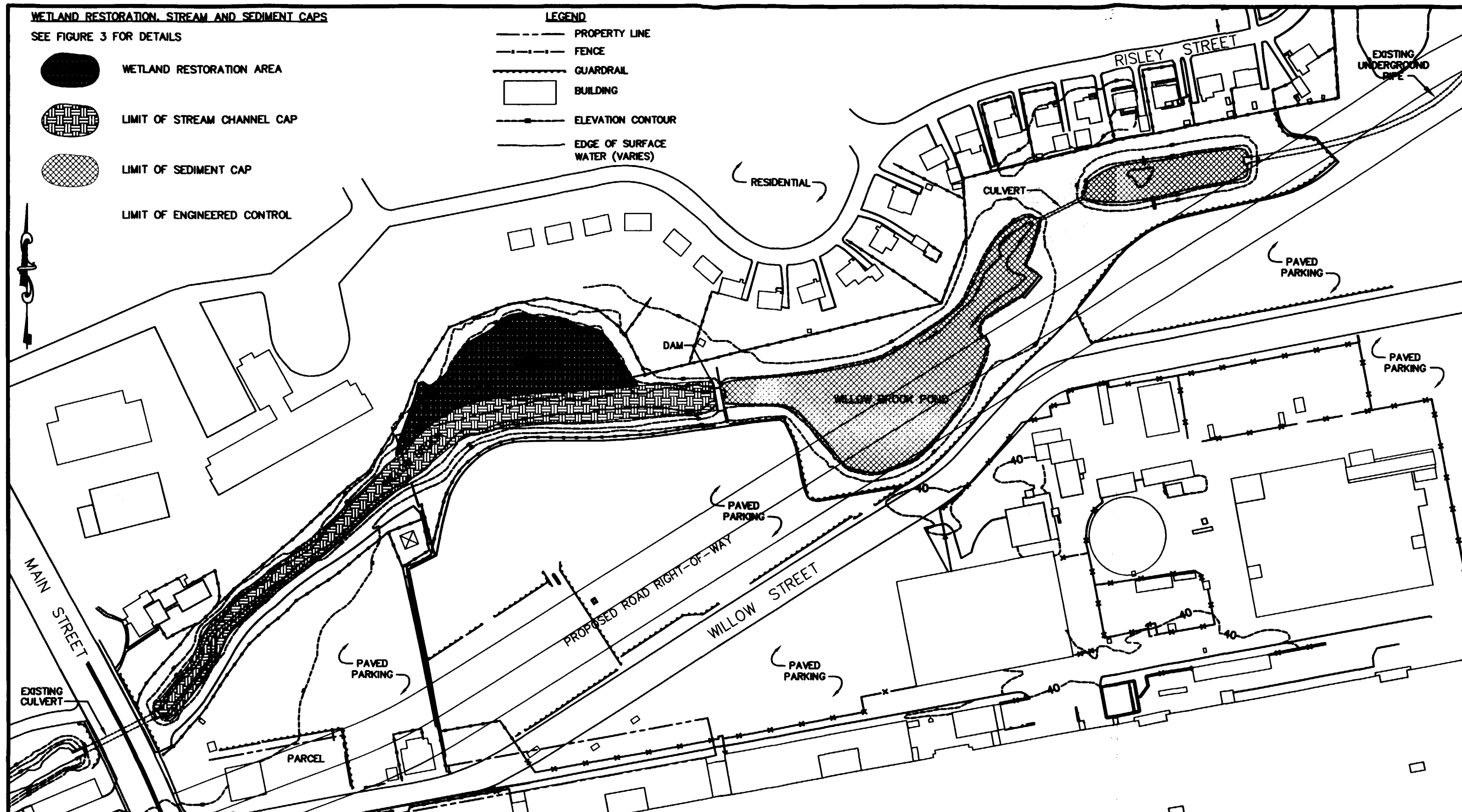


WETLAND RESTORATION, STREAM AND SEDIMENT CAPS

SEE FIGURE 3 FOR DETAILS

-  WETLAND RESTORATION AREA
-  LIMIT OF STREAM CHANNEL CAP
-  LIMIT OF SEDIMENT CAP
-  LIMIT OF ENGINEERED CONTROL

- ## LEGEND
-  PROPERTY LINE
 -  FENCE
 -  GUARDRAIL
 -  BUILDING
 -  ELEVATION CONTOUR
 -  EDGE OF SURFACE WATER (VARIES)



NOTES

1. BASE MAP FROM ELECTRONIC FILE OF LOUREIRO ENGINEERING ASSOCIATES, P.C. DRAWING, DATED 12/1/98 AND FROM USGS AERIAL PHOTOGRAPHY, 1994.

Original includes color coding.

REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/P & W, Willow Brook & Willow Brook Pond

WILLOW STREET ROADWAY REALIGNMENT





Comm.No.

88UT002.001

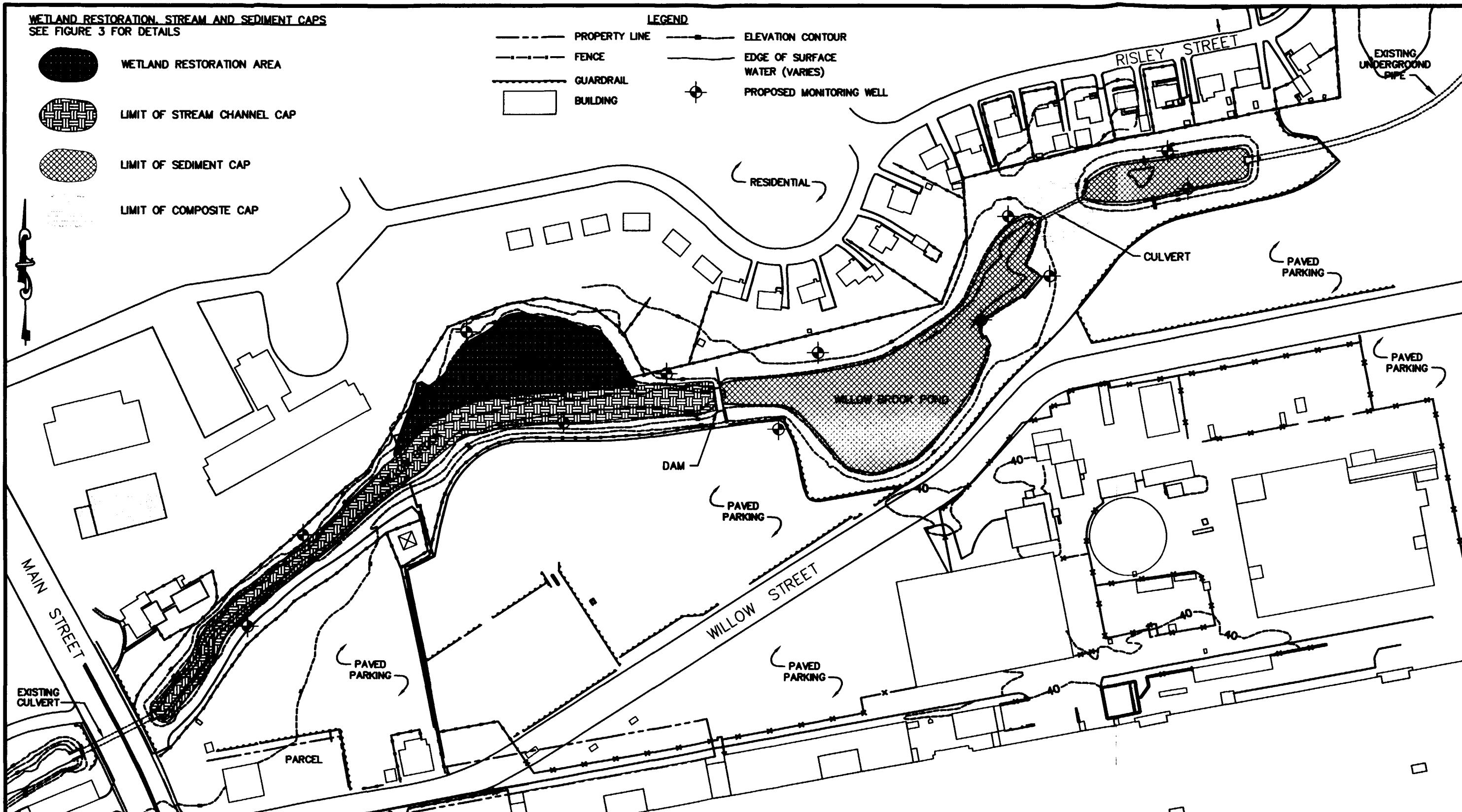
FIGURE 3-3



WETLAND RESTORATION, STREAM AND SEDIMENT CAPS
SEE FIGURE 3 FOR DETAILS

-  WETLAND RESTORATION AREA
-  LIMIT OF STREAM CHANNEL CAP
-  LIMIT OF SEDIMENT CAP
-  LIMIT OF COMPOSITE CAP

- LEGEND**
- PROPERTY LINE
 - - - FENCE
 - - - GUARDRAIL
 - BUILDING
 - ELEVATION CONTOUR
 - EDGE OF SURFACE WATER (VARIES)
 - ⊕ PROPOSED MONITORING WELL



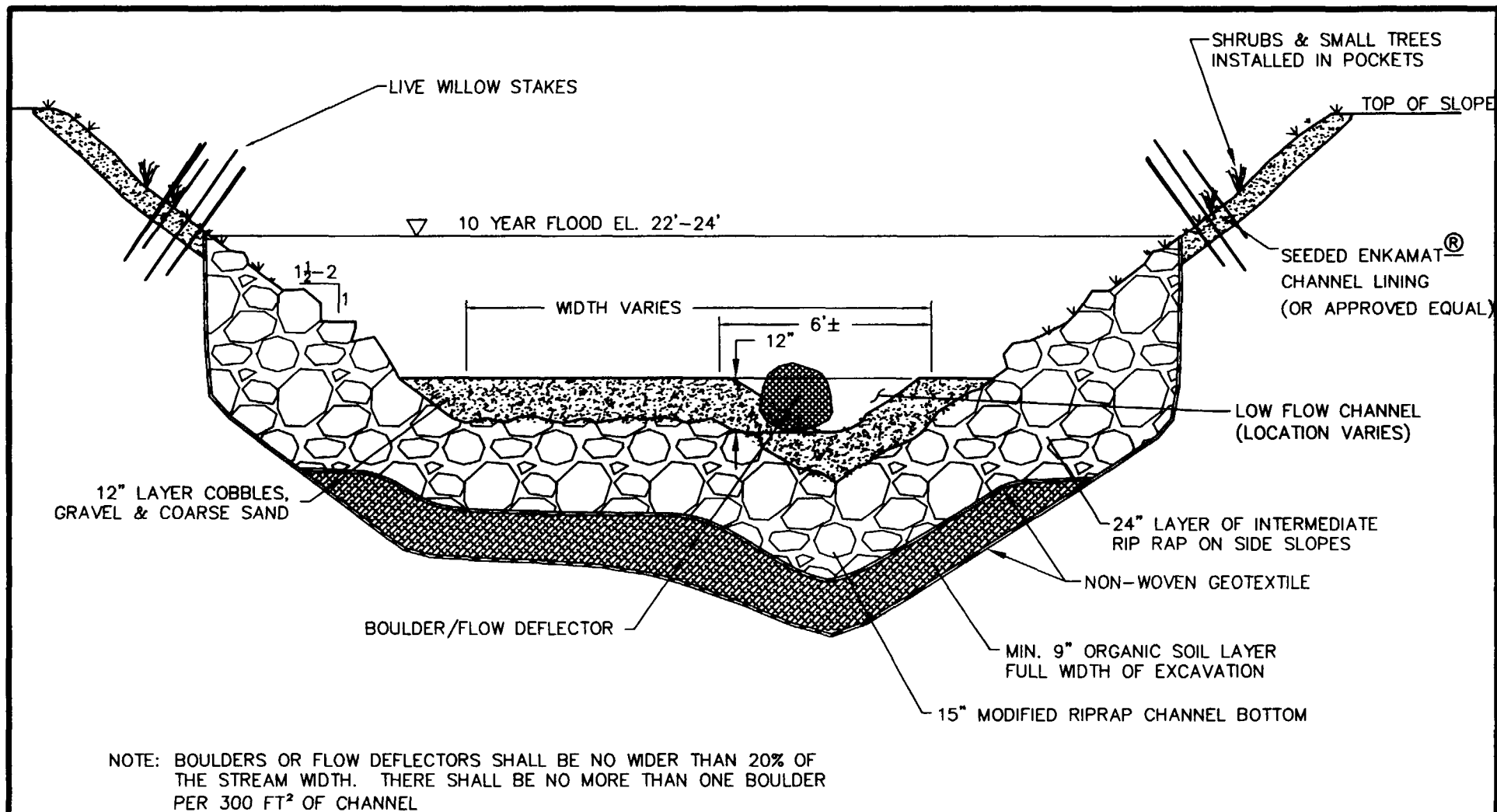
- NOTES:**
1. BASE MAP FROM ELECTRONIC FILE OF LOUREIRO ENGINEERING ASSOCIATES, P.C. DRAWING, DATED 12/1/98 AND FROM USGS AERIAL PHOTOGRAPHY, 1994.

Original includes color coding.

REQUEST FOR ENGINEERED CONTROL VARIANCE UTC/P & W, Willow Brook & Willow Brook Pond	
SITE RESTORATION PARTIAL EXCAVATION AND ENGINEERED CONTROL	
Comm.No. 88UT002.001	FIGURE 3-5

REV: 5/29/01

88UT002-FG3-5REV.dwg



REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/P & W, Willow Brook & Willow Brook Pond

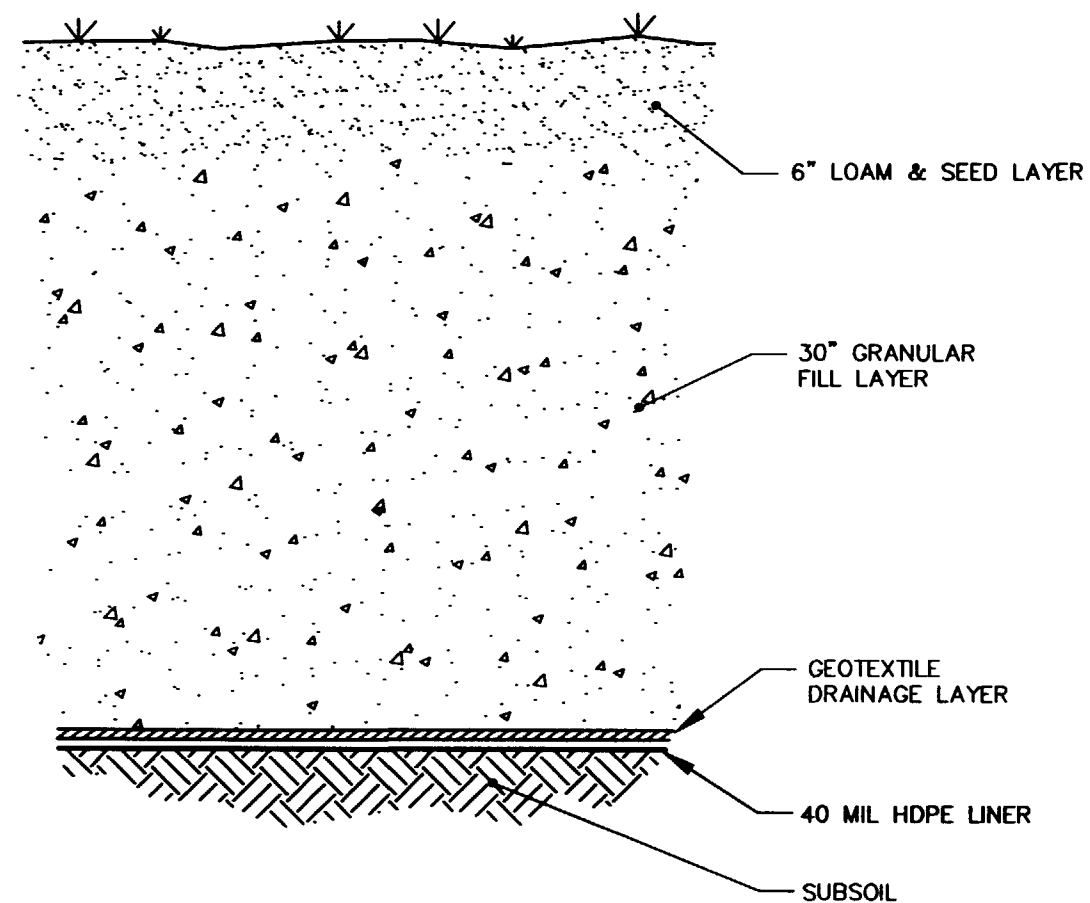
DETAIL - STREAM CHANNEL

Comm.No.
88UT002

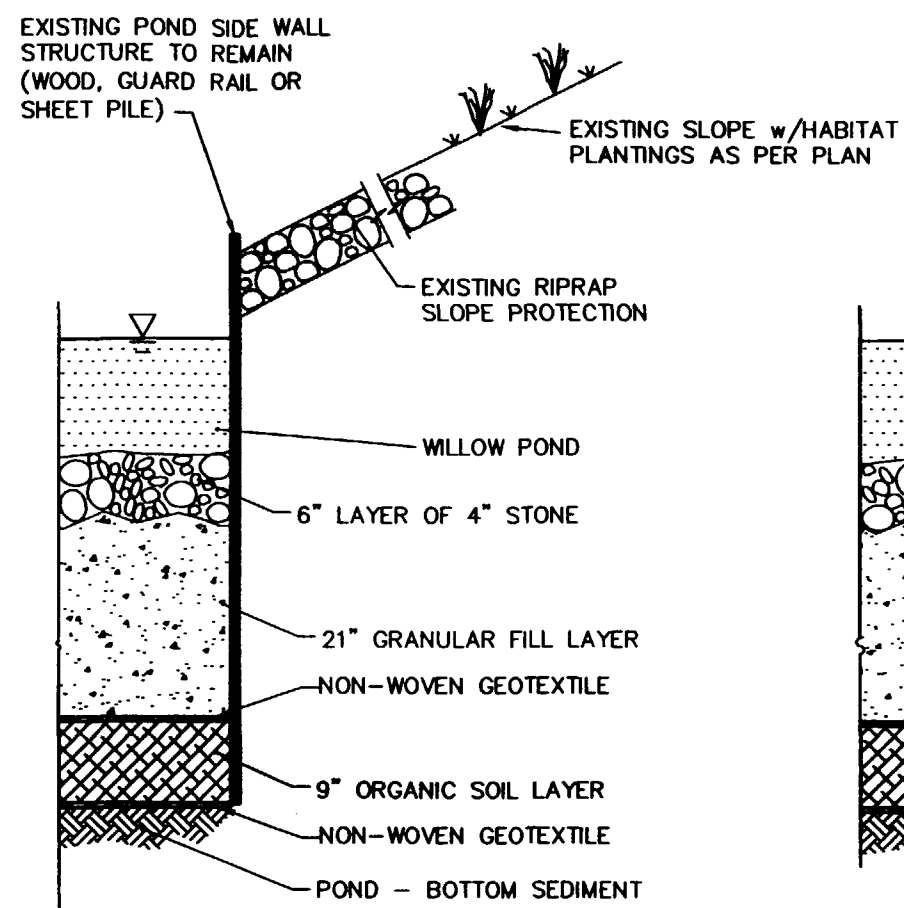
FIGURE 3-6



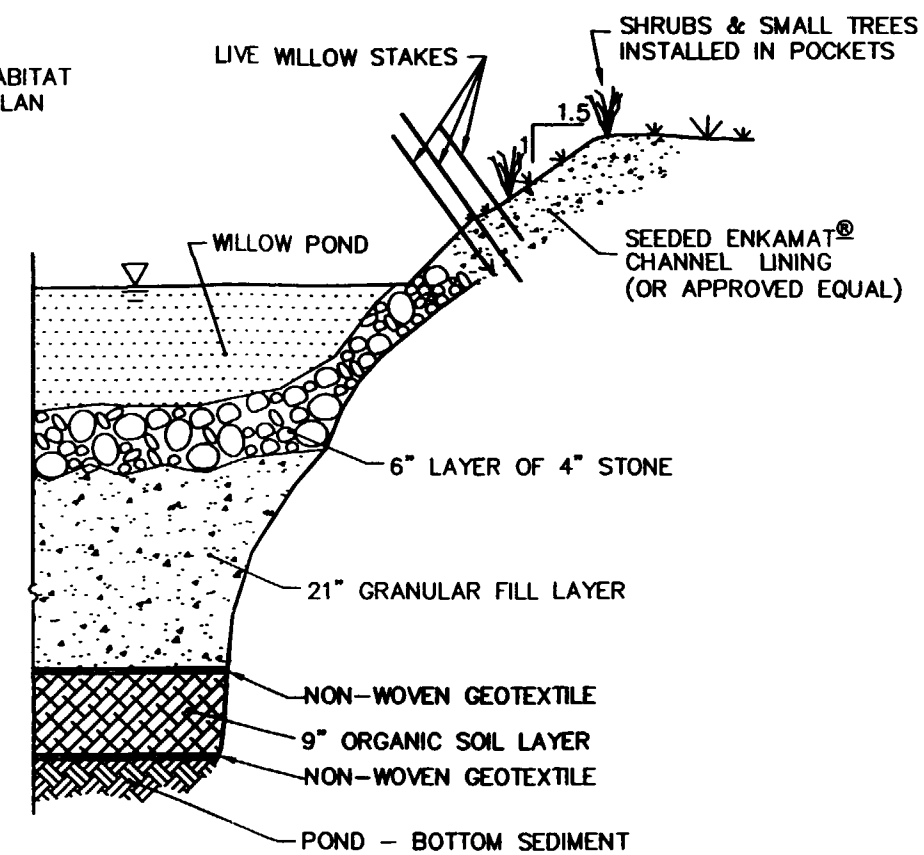
comp-DET-Stream.dwg



COMPOSITE CAP
NOT TO SCALE

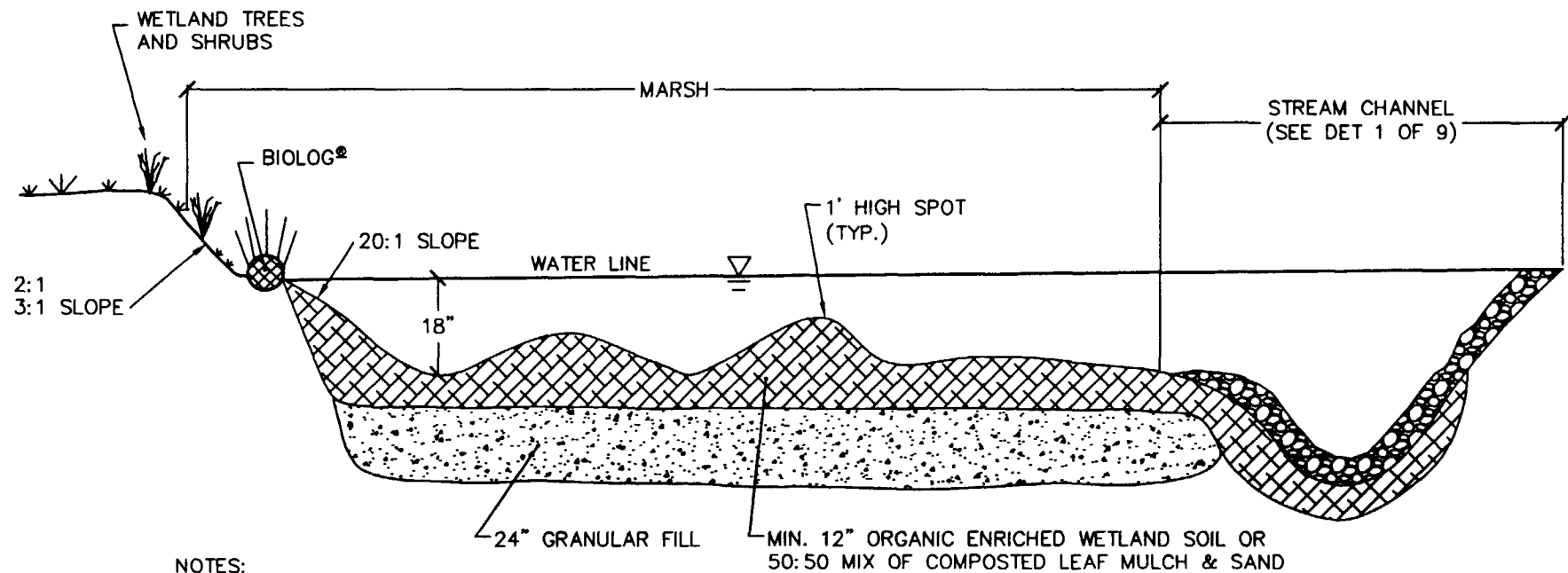


LOWER POND
NOT TO SCALE



UPPER POND
NOT TO SCALE

REQUEST FOR ENGINEERED CONTROL VARIANCE UTC/V & W. Willow Brook & Willow Brook Pond		
COMPOSITE CAP UPPER POND AND LOWER POND CAP DETAILS		
Comm.No. 88UT002.001	FIGURE 3-7	LEA



NOTES:

- 1 PLANT 25% OF MARSH SURFACE WITH WETLAND HERBS AND EMERGENTS @ 2' O.C.
- 2 PLANT 25% OF WETLAND EDGE WITH TREES AND SHRUBS, 5' AVERAGE O.C., IN MASSES
- 3 PLANT BERM AND HIGH SPOTS WITH WETLAND SHRUBS.
- 4 PLANT BIOLOG[®] WITH WETLAND HERBS AT 1' O.C.
- 5 HIGH SPOTS TO BE 1'± ABOVE MARSH SURFACE.
- 6 SEED ALL EXPOSED WETLAND AREAS IN BLACKLEDGE RIVER NURSERY WETLAND SEED MIX (OR APPROVED EQUAL) AT 11b/3000 ft²
- 7 SOIL SURFACE TO BE 6" - 18" BELOW WATER LEVEL OF STREAM.

NOT TO SCALE

REQUEST FOR ENGINEERED CONTROL VARIANCE
UTC/P & W, Willow Brook & Willow Brook Pond

DETAIL - WETLAND RESTORATION

Comm.No.

88UT002

FIGURE 3-8



88UT002-CAP-WETLAND.dwg

Appendix A

Summary of Historical Analytical Results



**US EPA New England
RCRA Document Management System (RDMS)
Image Target Sheet**

RDMS Document ID# 1120

Facility Name: PRATT & WHITNEY (MAIN STREET)

Phase Classification: R-12

**Document Title: REQUEST FOR VARIANCE ENGINEERED
CONTROL OF POLLUTED SOILS**

Date of Document: 05/01/2001

Document Type: REPORT

Purpose of Target Sheet:

☒ **Oversized** ☐ **Privileged**

☐ **Page(s) Missing** ☐ **Other** (Please Provide Purpose
Below)

Comments:

**DRAWING 1: PCB DATA AND SAMPLING LOCATIONS -
WILLOW BROOK**

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

**US EPA New England
RCRA Document Management System (RDMS)
Image Target Sheet**

RDMS Document ID# 1120

Facility Name: PRATT & WHITNEY (MAIN STREET)

Phase Classification: R-12

**Document Title: REQUEST FOR VARIANCE ENGINEERED
CONTROL OF POLLUTED SOILS**

Date of Document: 05/01/2001

Document Type: REPORT

Purpose of Target Sheet:

☒ **Oversized** ☐ **Privileged**

☐ **Page(s) Missing** ☐ **Other** (Please Provide Purpose
Below)

Comments:

**DRAWING 2: ANALYTICAL DATA & SAMPLING
LOCATIONS - WILLOW BROOK POND**

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

**US EPA New England
RCRA Document Management System (RDMS)
Image Target Sheet**

RDMS Document ID# 1120

Facility Name: PRATT & WHITNEY (MAIN STREET)

Phase Classification: R-12

**Document Title: REQUEST FOR VARIANCE ENGINEERED
CONTROL OF POLLUTED SOILS**

Date of Document: 05/01/2001

Document Type: REPORT

Purpose of Target Sheet:

☒ **Oversized** ☐ **Privileged**

☐ **Page(s) Missing** ☐ **Other** (Please Provide Purpose
Below)

Comments:

**DRAWING 3: ANALYTICAL DATA & SAMPLING
LOCATIONS - WILLOW BROOK**

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

**US EPA New England
RCRA Document Management System (RDMS)
Image Target Sheet**

RDMS Document ID# 1120

Facility Name: PRATT & WHITNEY (MAIN STREET)

Phase Classification: R-12

**Document Title: REQUEST FOR VARIANCE ENGINEERED
CONTROL OF POLLUTED SOILS**

Date of Document: 05/01/2001

Document Type: REPORT

Purpose of Target Sheet:

☒ **Oversized** ☐ **Privileged**

☐ **Page(s) Missing** ☐ **Other** (Please Provide Purpose
Below)

Comments:

DRAWING 4: GROUNDWATER DATA - WILLOW POND

*** Please Contact the EPA New England RCRA Records Center to View This Document ***

Appendix B

Detailed Cost Estimate – Complete Excavation



Request for Variance
Engineered Control of Polluted Soils
United Technologies Corporation
Pratt & Whitney

Operation and Maintenance Costs:

Subtotal - Groundwater Monitoring:	\$89,000
Total Estimated Project Cost:	\$9,354,888

Appendix C

Detailed Cost Estimate – Partial Excavation and Engineered Control



Detailed Construction Cost Estimate - Partial Excavation and Engineered Control

Request for Variance Engineered Control of Polluted Soils United Technologies Corporation Pratt & Whitney

Work Item	Unit Cost	Units	Number of Units	Extended Cost
Engineering/Design	\$525,000	l.s.	1	\$525,000
Permitting and meetings with agencies	\$107,000	l.s.	1	\$107,000
Health and Safety Plan	\$5,000	l.s.	1	\$5,000
Mobilization/Demobilization	\$36,300	each	2	\$72,600
Site Preparation				
Erosion control	\$3	l.f.	1,000	\$3,000
Clearing and grubbing	\$10,000	acre	2	\$20,000
Decontamination facilities	\$10,000	l.s.	1	\$10,000
Temporary construction fence	\$5	l.f.	1,000	\$5,000
Subtotal				\$38,000
Demolition of Structures				
Demolish existing structures (building)	\$4,300	day	15	\$64,500
Offsite disposal of PCB-contaminated demolition debris	\$165	ton	400	\$66,000
Debris disposal	\$2,000	load	10	\$20,000
Subtotal				\$150,500
Contaminated Soil/Sediment Excavation				
Water Diversion	\$58,000	month	4	\$232,000
Dewatering	\$2,000	week	8	\$16,000
Dewatering Wastewater Treatment	\$7,600	week	8	\$60,800
Excavate contaminated soil/sediment and lime stabilize (>25 ppm PCBs above dam)	\$32	c.y.	5,100	\$163,200
Excavate contaminated soil/sediment and lime stabilize (>25 ppm PCBs below dam)	\$32	c.y.	3,400	\$108,800
Excavate contaminated soil/sediment and lime stabilize (1 to 25 ppm PCBs in wetland)	\$32	c.y.	1,500	\$48,000
Excavate contaminated soil/sediment and lime stabilize for cap installation below dam	\$32	c.y.	2,500	\$80,000
Transportation and disposal of contaminated soil/sediment (< 50 ppm PCBs)	\$81	ton	10,710	\$867,510
Transportation and disposal of contaminated soil/sediment (> 50 ppm PCBs)	\$155	ton	12,920	\$2,002,600
Confirmatory sampling and analysis	\$226,000	l.s.	1	\$226,000
Subtotal				\$3,804,910
Site Restoration				
Engineered Control/Stream Channel and Pond Restoration	\$125,000	acre	4.5	\$562,500
Install rip-rap channel protection (below dam)	\$51	s.y.	5,250	\$267,750
Install four monitoring wells within Willow Brook and Willow Brook Pond	\$500	each	4	\$2,000
Permanent fencing	\$22	l.f.	5,000	\$110,000
Permanent vehicle gates (3)	\$1,500	each	3	\$4,500
Permanent access gates (5)	\$300	each	5	\$1,500
Subtotal				\$948,250
Miscellaneous				
Office Trailer	\$25,000	l.s.	1	\$25,000
Site Security	\$1,500	week	30	\$45,000
Survey during construction	\$60,000	l.s.	1	\$60,000
Subtotal				\$130,000
Wetlands Restoration	\$65,000	acre	1	\$65,000
Total Estimated Project Construction Cost				\$5,846,260

Operation and Maintenance Costs:

Post Remediation Groundwater Monitoring Annual Cost	\$26,000
Post Remediation Operation and Maintenance	\$3,500
Assume 30 years, interest rate of 4% (factor of 17.12)	\$505,040

Subtotal Groundwater Monitoring and Operation and Maintenance:	\$505,040
Total Estimated Project Cost:	\$6,351,300

Appendix D

Post Remediation Groundwater Monitoring Plan



**United Technologies/Pratt & Whitney
Post Remediation Groundwater Monitoring Plan
Willow Brook and Willow Brook Pond**

The following is a description of the planned groundwater monitoring to be implemented following the remediation of contaminated soil and sediment within and immediately surrounding Willow Brook and Willow Brook Pond. The groundwater monitoring will be performed in accordance with subsection (g)(2) of Section 22a-133k-3 of the RCSA.

This groundwater monitoring program has been designed to determine:

- The effectiveness of soil remediation in preventing further pollution of ground water by substances from the release area;
- The effectiveness of any remediation taken to eliminate or minimize identified health or safety risks associated with such release; and
- Whether applicable surface-water protection criteria and volatilization criteria have been met.

New Well Installation

During construction, it is likely that a number of existing groundwater monitoring wells will be impacted. Following implementation of remedial activities, groundwater monitoring wells will be installed at the 13 locations depicted on the attached Site Plan. Nine of the groundwater monitoring wells will be installed around the periphery of Willow Brook and Willow Brook Pond and four wells will be installed within Willow Brook and Willow Brook Pond. Each of the nine wells will be small-diameter monitoring wells constructed using the Geoprobe® Pre-Pack monitoring well construction materials. The pre-pack construction consists of three foot-long sections of ½ inch inside diameter, 0.010-inch slotted Schedule 80 PVC screen with a 1.5-inch diameter filter pack held in place by stainless steel mesh. The pre-pack screen sections may be joined to provide screen length multiples of three feet. A ½-inch diameter Schedule 80 PVC riser connects the screen to the surface.

Screen lengths for the nine monitoring wells to be installed along the periphery of Willow Brook and Willow Brook Pond will be nine feet, with approximately 5 to 7 feet placed below the water table. After the screen and riser are installed, one to two feet of sand will be placed above the screen to prevent the bentonite seal from leaking downward into the screened interval. A bentonite seal will be placed from the top of the sand cap to the surface. Emplacement of the sand cap and the bentonite seal will be performed while slowly retrieving the casing, allowing the native formation material to collapse around the backfill material.



**United Technologies/Pratt & Whitney
Post Remediation Groundwater Monitoring Plan
Willow Brook and Willow Brook Pond**

Screen lengths for the four wells to be installed within the limits of Willow Brook and Willow Brook pond will be one foot. The screen section will be installed so that the screen will partially penetrate the granular fill portion of the cap section to allow for the collection of a sample that is representative of soil water above the organic-rich layer within the cap. These wells are being proposed to allow for the collection of data to confirm that the organic-rich layer is preventing the upward migration of PCBs through the cap. These four monitoring wells will be installed during the installation of the caps.

All wells will be installed in general conformance with LEA's SOPs entitled, *Standard Operating Procedure for Installing and Developing Monitoring Wells and Piezometers* and *Geoprobe® Probing and Sampling*.

Well Development

All post remediation groundwater monitoring wells will be developed to ensure that an adequate hydraulic connection exists between the well and the aquifer. Prior to development, measurements of total depth and water level will be made at each well. Development will be conducted in general conformance with the LEA SOP entitled, *Standard Operating Procedure for Installing and Developing Monitoring Wells and Piezometers*. Development water will be placed into DOT-approved 55-gallon containers for offsite disposal at a licensed disposal facility.

Monitoring wells will be developed by over-pumping using a peristaltic pump to draw down the well, followed by physical surging. After surging, the well will be pumped to remove accumulated sediment. The cycle will be repeated until the well produces clean water or until the physical parameters (temperature, pH, specific conductance) stabilize. Further development by over-pumping or surging will be performed as necessary to stabilize the field parameters.

Groundwater Monitoring Implementation Schedule

Groundwater samples will be collected from each of the 13 groundwater monitoring wells on a quarterly basis for a period of not less than two years. If, following the two years of quarterly groundwater monitoring, it is determined that the area is in compliance with the requirements of subsection (f) of Section 22a-133k-3 of the RCSA, groundwater monitoring will be discontinued. If the area is not in compliance with the requirements of subsection (f) of Section 22a-133k-3 of the RCSA, groundwater monitoring will be continued for a period of time until the results of four



**United Technologies/Pratt & Whitney
Post Remediation Groundwater Monitoring Plan
Willow Brook and Willow Brook Pond**

consecutive quarterly sampling events indicate compliance with the surface water protection and commercial/industrial volatilization criteria.

Groundwater Sampling and Analysis

All groundwater samples will be collected and preserved, as appropriate, in accordance with the LEA SOP entitled, *Liquid Sample Collection and Field Analysis*. Prior to sampling each groundwater monitoring wells noted above, the depth to water and total depth of each well will be recorded. From this information the total volume of water contained in each monitoring well will be calculated. The water will be purged initially and parameters such as pH, temperature, and specific conductance will be recorded. Once the initial volume of water is removed, the monitoring well will be purged a minimum of three times the standing water volume or until all standing water is evacuated. Samples will be collected using a peristaltic pump equipped with dedicated polyethylene tubing. A section of tubing equipped with a check valve will be used for the collection of samples to be analyzed for volatile organic compounds (VOCs). Samples collected for metals will not be filtered prior to analysis. All sampling containers will be sealed, placed in a cooler, and shipped to a laboratory selected by UTC/P&W under chain-of-custody procedures for the following analyses:

- Volatile Organic Compounds
- The RCRA 8 metals plus copper, nickel, and zinc;
- Extractable petroleum hydrocarbons; and
- Polychlorinated biphenyls.

Trip blanks, equipment blanks, and duplicate/replicate samples will be submitted for analysis for quality assurance/quality control (QA/QC) purposes. In addition, on an annual basis, one performance evaluation sample will be submitted to the analytical laboratory.

Water-Level Measurements

Water level measurements will be performed. Both groundwater and surface water level measurements will be obtained. Surface water elevations will be obtained from stream gauges to be installed in Willow Brook and Willow Brook Pond. All water levels will be recorded to the nearest 0.01-foot using an electronic water level indicator. Between measurements the water level indicator will be decontaminated to prevent cross-contamination. Based on the data



**United Technologies/Pratt & Whitney
Post Remediation Groundwater Monitoring Plan
Willow Brook and Willow Brook Pond**

collected from the shallow monitoring wells and piezometers, contour maps showing groundwater elevation and flow direction will be developed.

Surface Water Sampling

If during the performance of groundwater sampling, polychlorinated biphenyls (PCBs) are detected at concentrations in excess of the surface water protection criteria in groundwater samples collected from the four groundwater monitoring wells installed in the granular fill portion of the cap, surface water samples will be collected to verify that PCBs are not present in surface water at concentrations in excess of the ambient water quality criteria. The surface water samples would be collected at a depth not greater than 4 inches above the top of the cap section in the immediate vicinity of the well or wells for which the exceedance of the surface water protection criteria was noted. Surface water samples would be collected within one week of receipt of analytical data indicating an exceedance of surface water protection criteria in the above-mentioned wells.

Reporting





On an annual basis, the results of the quarterly sampling will be summarized in a single report. The report will contain a description of the sampling activities, an evaluation of the analytical results including a discussion of any observed trends, a site location plan, groundwater contour maps for each of the four quarterly sampling events, and tabular presentations of the data. Following the completion of the second year of groundwater monitoring, the annual report will include a discussion regarding the compliance status with respect to the requirements of the surface water protection criteria and commercial/industrial volatilization criteria in the RSR. If the site is determined to be in compliance, the report will also contain a discussion regarding the cessation of groundwater monitoring. If the site is determined to not be in compliance, the report will contain a discussion regarding the continuation of groundwater monitoring.









Each annual report will be submitted to the DEP and the USEPA for review.

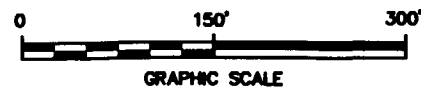
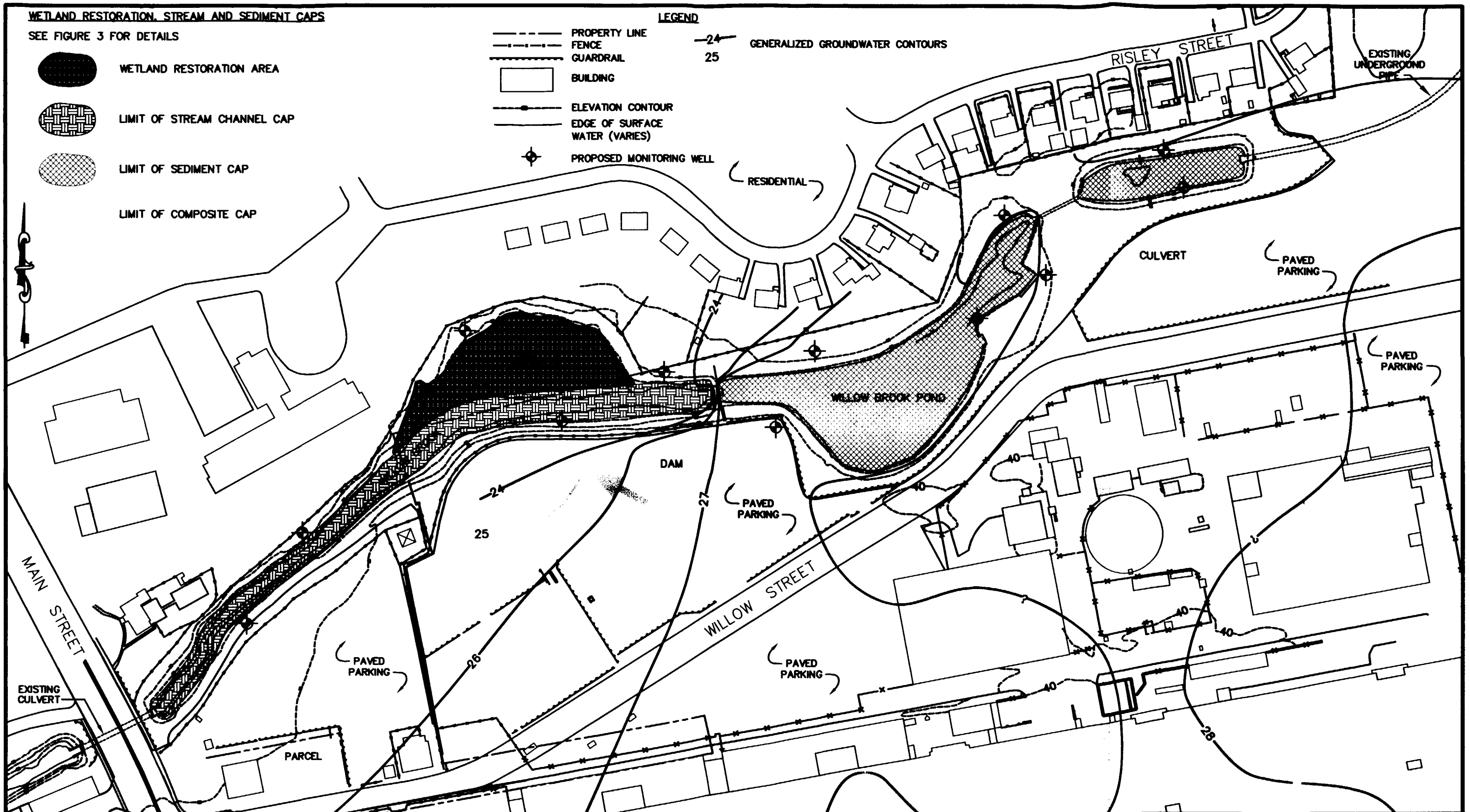


WETLAND RESTORATION, STREAM AND SEDIMENT CAPS

SEE FIGURE 3 FOR DETAILS

-  WETLAND RESTORATION AREA
-  LIMIT OF STREAM CHANNEL CAP
-  LIMIT OF SEDIMENT CAP
-  LIMIT OF COMPOSITE CAP

- LEGEND**
-  PROPERTY LINE
 -  FENCE
 -  GUARDRAIL
 -  BUILDING
 -  ELEVATION CONTOUR
 -  EDGE OF SURFACE WATER (VARIES)
 -  PROPOSED MONITORING WELL
 -  GENERALIZED GROUNDWATER CONTOURS



NOTES:

1. BASE MAP FROM ELECTRONIC FILE OF LOUREIRO ENGINEERING ASSOCIATES, P.C. DRAWING, DATED 12/1/98 AND FROM USGS AERIAL PHOTOGRAPHY, 1994.

Original includes color coding.

REQUEST FOR ENGINEERED CONTROL VARIANCE
UTCVP & W. Willow Brook & Willow Brook Pond

POST REMEDIATION
GROUNDWATER MONITORING PLAN
MONITORING WELL LOCATIONS

Comm.No.

88UT002.001

FIGURE 1



REV: 5/29/01

88UT002-F101DWV2.dwg

Appendix E

Post Remediation Maintenance Program



**United Technologies/Pratt & Whitney
Post Remediation Maintenance and Monitoring Program
Willow Brook and Willow Brook Pond**

This post-remediation maintenance program for the engineered control has been developed to ensure that the structural integrity, design permeability, and effectiveness of the engineered control will be maintained. This maintenance program describes:

- Measures to be taken to periodically inspect the engineered control;
- Measures to be taken to prevent run-on and run-off of stormwater from eroding or otherwise damaging the engineered control; and
- Measures to be taken to correct the effects of any settling, subsidence, erosion or other damaging events or conditions.
-

The engineered control has been designed to require a minimal amount of maintenance. The required maintenance tasks are presented below.

- Regular mowing and maintenance of the area surrounding Willow Brook and Willow Brook Pond (assumed to be 3 acres mowed 20 times per year);
- Visual inspection of the stream channel of Willow Brook to ensure the rip-rap channel protection has not been impacted;
- Inspection, via probing at up to 20 locations, of the bottom of Willow Pond to ensure the stone layer has not been eroded;
- Inspection of the engineered control installed in the vicinity of the former oil/water separator; and
- Preparation of a report documenting the inspection and the required maintenance tasks have been completed and the completion of any repairs performed in response to findings from inspections. The annual reports will be maintained by UTC/P&W.



**United Technologies/Pratt & Whitney
Post Remediation Maintenance and Monitoring Program
Willow Brook and Willow Brook Pond**

Annual Inspections and Corrective Actions

The engineered control and the area surrounding the engineered control will be inspected on an annual basis by a representative of United Technologies Corporation/Pratt & Whitney Division in the following areas:

1. Signs of erosion
2. Signs of settling
3. Loss of vegetative cover
4. Undesirable growth
5. Signs of ponding and run on
6. Condition of Fencing and gates
7. Condition of rip-rap in Willow Brook stream channel
8. Condition of stone layer in Willow Brook
9. Burrowing animals
10. Monitoring well network

The results of these inspections will be summarized in the Final Cover Inspection Form presented as Exhibit 1. If any deficiencies are noted, the appropriate corrective actions will be taken as described in the following paragraphs.

Any erosion damage to vegetated surfaces will be corrected during the growing season (April through September) by reapplying the appropriate soil layers and reseeding the damaged areas. Similarly, any damage related to settling would be repaired in the same manner. A survey would be conducted following this repair to verify that the final grade was returned to that which is specified on the as-built grading plan. Erosion to sub aqueous caps or rip-rap along the Willow Brook stream channel would be corrected within one month of the inspection by installation of additional stone or rip-rap.

Loss of vegetative cover will be repaired by reseeding, replanting, fertilizing and watering as necessary until plant growth is re-established. Reseeding and replanting will be performed during the growing season (April through September). In addition, any undesirable plant growth that could affect the integrity of the engineered control (i.e. small trees, saplings, shrubs) would be manually removed as soon as detected, and the cover system would be repaired as described previously for erosion damage.

If any burrowing animals were found to be living in the area of the engineered control, appropriate measures would be taken to remove the animals from the site. The synthetic components of the engineered control in the vicinity of the oil water separator will also be inspected to verify that no damage has taken place. Any holes made by burrowing animals



**United Technologies/Pratt & Whitney
Post Remediation Maintenance and Monitoring Program
Willow Brook and Willow Brook Pond**

would be filled with topsoil and reseeded. Damage to the synthetic liner will be repaired by patching in accordance with the manufacturer's requirements.

Any damaged fence or gates will be repaired.

Any deficiencies found will be corrected within 4 weeks from the time of discovery or as soon as practicable if weather conditions prohibit correction within 4 weeks.

Inspections Following Significant Precipitation Events and Corrective Actions

The engineered control and the area surrounding the engineered control will be inspected on an annual basis as described above, and following the occurrence of a precipitation event resulting in greater than or equal to 2 inches of rainfall over a 24-hour period. The inspection would be performed by a representative of United Technologies Corporation/Pratt & Whitney Division in the same areas as described for the annual inspection above. Documentation of the inspection and corrective actions would be in accordance with the procedures outlined above for annual inspections.

Reporting

On an annual basis, a report will be generated documenting all inspection, maintenance and corrective actions completed during the previous calendar year. The report will be completed by January 31. United Technologies Corporation/Pratt & Whitney Division will maintain the annual reports.



**United Technologies/Pratt & Whitney
Post Remediation Maintenance and Monitoring Program
Willow Brook and Willow Brook Pond**

Exhibit 1

Post-Remediation Maintenance Inspection Form



**United Technologies/Pratt & Whitney
Post Remediation Maintenance Program
Willow Brook and Willow Brook Pond**

Weather Conditions: _____
Inspection Date: _____
Inspection Time: _____

Inspector: _____
Reviewed By: _____

INSPECTION POINT	DESCRIPTION	GOOD	FAIR	POOR
1) Signs of erosion	Check for gullies of more than 2 inches in depth.			
2) Signs of settling	Look for ponding and for settling of soil of more than 3 inches over a 5 sq. foot area.			
3) Loss of vegetative cover	Check for loss of vegetation cover in any area greater than 5 square feet.			
4) Undesirable growth	Check for growth that is in excess of ½ inch in diameter (woody vegetation) and taller than 2 feet.			
5) Signs of ponding and run on	Look for areas of more than 5 square feet of standing water or areas where surface water is running onto cap.			
6) Condition of fencing and gates	Check perimeter fence to make sure it is not damaged (no holes greater than 4-inches in diameter), gates are operable, and locks are in place.			
7) Condition of rip-rap in Willow Brook stream channel	Observe entire length of stream channel. Verify that rip-rap has not been displaced.			
8) Condition of stone layer in Willow Brook	Perform probing of bottom of Willow Brook Ponds at 5 locations in upper pond and 15 locations within lower pond. Verify refusal on stone layer at all locations.			
9) Burrowing animals	Verify no holes larger than 2 inches in diameter in cap.			
10) Monitoring well network	Check concrete collar protective casing, locks, legible well identification.			
	1. Condition of lock			
	2. Visible ID of wells			
	3. Ponding or infiltration of surface water			
	4. Condition of concrete collar			
	5. Condition of steel casing			

Report all deficiencies to the designated representative of The Stanley Works

List all deficiencies, the corrective measures taken, and the date corrective measures were completed:

1) _____

Corrective Action: _____

2) _____

Corrective Action: _____

3) _____

Corrective Action: _____

4) _____

Corrective Action: _____

